Buyers' Guides:

Programmable Power Supplies

Wi-Fi Hotspot Devices

Components for LED Lighting

Market Survey: LCD Manufacturing Ecosystem

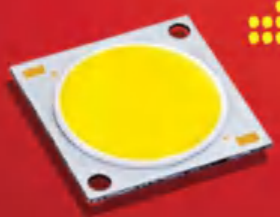
₹100

DECEMBER 2015

electronics FOR YOU PLUS

SOUTH ASIA'S MOST POPULAR ELECTRONICS MAGAZINE

THE LIGHTING ISSUE



An EFYGROUP Publication
Vol. 04 No. 08
ISSN 2454-4426
Pages: 140+8 | UK £6; US $12

Let's Get Started With Intel Galileo

Joystick Based Stepper Motor Angle Controller

Solar Garden Lamp

Home Theatre Backlight Unit

Frequency Shift Keying Communication Simulator

TOP 5 DO-IT-YOURSELF

Get to the problem before the problem gets to you.

Confidently detect problems with 4 times better resolution.

Get to the heat of the problem fast with Keysight True/*R* Thermal Imagers. Avoid an unplanned shutdown **with this lightweight, easy-to-use handheld device. With the in-camera fine resolution of 320X240 pixels** you'll spot issues quickly, clearly and as close as 10 cm away. That's 4 times better than competitors and at no added cost. You can't afford a factory shutdown, but you can afford the Keysight True/*R* Thermal Imager.

	U5855A	U5856A	U5857A
Detector resolution	160 x 120 (19,200 pixels)		
In-camera fine resolution	320 x 240 (76,800 pixels)		
Temperature measurement range	–20 °C to +350 °C	–20 °C to +650 °C	–20 °C to +1200 °C
Spatial resolution (IFOV)	3.1 mrad (2.1 mrad with fine resolution)		
Sensitivity	0.07 °C at 30 °C		

Limited time only: FREE 5 year warranty
www.keysight.com/find/True/Rimager

For more information: Call: 1800 11 2626 (toll free), (0124) 229 2010 or email: tm_india@keysight.com, website : www.keysight.com

KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

ECN 2015 WINNER iMPACT Awards
Cooling and Thermal Management
U5855A TrueIR Thermal Imager

Agilent's Electronic Measurement Group is now **Keysight Technologies**.

The World's Largest Selection of Electronic Components Available for Immediate Shipment!™

We Source What's Inside YOUR DESIGN

US $40 SET RATE
SHIPPING TO INDIA*

000-800-100-1274
DIGIKEY.IN

Digi-Key® ELECTRONICS

1,100,000+ PRODUCTS IN STOCK | 650+ INDUSTRY-LEADING SUPPLIERS | 100% AUTHORIZED DISTRIBUTOR

*Orders can be shipped via Federal Express, UPS, or DHL for delivery within 3-4 days (dependent on final destination). If excessive weight or unique circumstances require deviation from this charge, customers will be contacted prior to shipping order. Digi-Key is an authorized distributor for all supplier partners. New products added daily. © 2015 Digi-Key Electronics, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA

ecia MEMBER ecsn CEDA

contents

ELECTRONICS FOR YOU PLUS | DECEMBER 2015 | VOL. 04 NO. 08 | ISSN-2454-4426

TECH FOCUS

BUYERS' GUIDE

DO-IT-YOURSELF

EFY Plus DVD

NEXT ISSUE
- Latest Technologies for Enabling the Internet
- Connectors and Terminals
- Development Boards

EDITOR : Ramesh Chopra

EDITORIAL CORRESPONDENCE : Editorial Secretary
Phone: 011-26810601; E-mail: editsec@efy.in
(Technical queries: efylab@efy.in)

SUBSCRIPTIONS & MISSING ISSUES : Phone: 011-26810601 or 02 or 03
E-mail: support@efy.in

BACK ISSUES, BOOKS, CDs, PCBs etc. : Kits'n'Spares, New Delhi
Phone: 011-26371661, 26371662
E-mail: info@kitsnspares.com

EXCLUSIVE NEWSSTAND DISTRIBUTOR : IBH Books & Magazines Distributors Ltd
Unit No.10, Bezzola Complex,
Opp. Suman Nagar, Sion Trombay Road,
Chembur, Mumbai 400 071
Phone: 022-40497401/02

ADVERTISEMENTS

NEW DELHI (HEAD OFFICE) : Ph: 011-26810601 or 02 or 03
E-mail: efyenq@efy.in

MUMBAI : Ph: 022-24950047, 24928520
E-mail: efymum@efy.in

BENGALURU : Ph: 080-25260394, 25260023
E-mail: efyblr@efy.in

CHENNAI : Ph: 044-42994363
E-mail: efyenq@efy.in

HYDERABAD : Ph: 040-67172633
E-mail: efyenq@efy.in

PUNE : Ph: 08800295610, 09870682995
E-mail: efypune@efy.in

GUJARAT: : Ph: 079-61344948
E-mail: efyahd@efy.in

CHINA : Power Pioneer Group Inc.
Ph: (86 755) 83729797, (86) 13923802595
E-mail: powerpioneer@efy.in

JAPAN : Tandem Inc., Ph: 81-3-3541-4166
E-mail: tandem@efy.in

SINGAPORE : Publicitas Singapore Pte Ltd
Ph: +65-6836 2272
E-mail: publicitas@efy.in

TAIWAN : J.K. Media, Ph: 886-2-87726780 ext. 10
E-mail: jkmedia@efy.in

UNITED STATES : E & Tech Media
Ph: +1 860 536 6677
E-mail: veroniquelamarque@gmail.com

SUBSCRIPTION RATES

Period	Newstand Price (₹)	You Pay (₹)	Digital (₹)	Overseas	
Year				Digital	Print
Two	2400	1800	750	US$ 15	—
One	1200	960	280	US$ 5	US$ 120

Please send payments only in favour of **EFY Enterprises Pvt Ltd**

Printed, published and owned by Ramesh Chopra. Printed at International Print-o-Pack Ltd, C-4 to C-11, Hosiery Complex, Phase-II Extension, NOIDA-201305, Gautam Budh Nagar, Uttar Pradesh, on the first day of each month and published from D-87/1, Okhla Industrial Area, Phase-1, New Delhi 110020.

Regulars

Drop it. Douse it.

Up to 8x longer battery life than the competition.

Need a high performance, high resolution digital multimeter (DMM)? Need a durable, general purpose DMM? Either way, Keysight has you covered. Introducing the Keysight U1280 and U1240C Handheld DMM Series. Not only are they intuitive, functional and durable, they offer truly outstanding battery life—up to eight times longer than its competition.

	Keysight U1280	Keysight U1240C
Resolution	60,000 counts	10,000 counts
Battery life	800 hours	400 hours
Ruggedness	IP 67 certifed for dust and water protection 3-meter (10 ft.) drop test	

Get your hands on the proof
www.keysight.com/find/U1280DMM-ad-ww

For more information: Call: 1800 11 2929 (toll free), (0124) 229 2009 or email: tm_india@keysight.com

KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

Find our products at:

AGMATEL PARTNERING INNOVATION
ARTS Applied MedTech Systems
SYNERGY Measurement Technologies P. Ltd.
RKe
Elmack Engg Services
ELMAX Projects & Services
Innovative Instruments Inc
Shubh Enterprises
SMPL
Automation System Engineers P. Ltd.

Agilent's Electronic Measurement Group is now **Keysight Technologies**.

FEEDBACK

Hat's off to EFY

Your service is excellent! It encourages us to contribute DIY articles as well as innovative thoughts. You also respond to our questions and doubts. Hat's off to EFY team!

Pamarthi Kanakaraja
Through email

EFY. Thanks for the feedback! Your feedback and suggestions are extremely important to us.

Thank You EFY

I am a ninth-grade student and refer to EFY for my school projects related to Internet safety, medical technology, robotics and more. EFY is an informative magazine. Thank you EFY!

Ashar
Through email

EFY. It is our pleasure to get an email from a ninth-grade student who is benefiting from EFY. And thanks for sharing your feedback! We are glad that you find the magazine useful.

Power Amplifier

In 'Power Amplifier for FM Transmitter' DIY article published in November 2014 issue, please mention the type of antenna used and also its construction in detail.

Jethava Nirupa
Through email

The author Joy Mukherji replies:

A ¼-wavelength ground plane antenna was used for testing at 96MHz and gave good results.

Mount the antenna as high as possible for maximum range. Construction details are shown in Figs 1 and 2.

Each arm is ¼-wavelength and consists of 12SWG-enameled copper wire. Different frequencies require different lengths of copper rods and 12SWG central radiators. These can be calculated using the relationship:

Length = 7488/F

where F is the frequency between 88MHz and 108MHz.

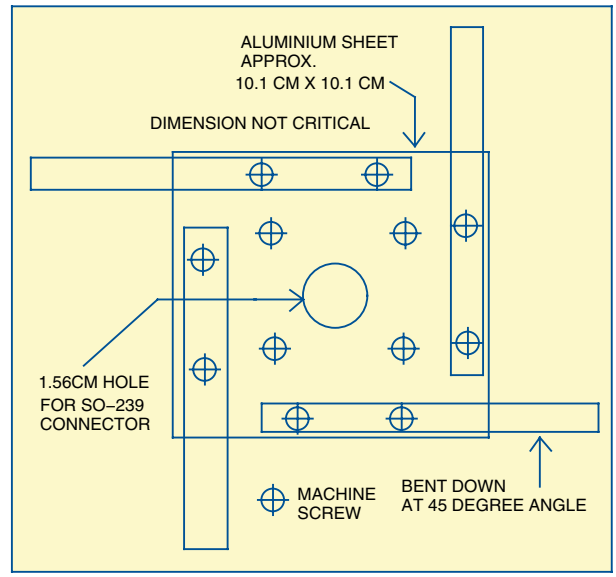


Fig. 1: Antenna made with aluminium sheet

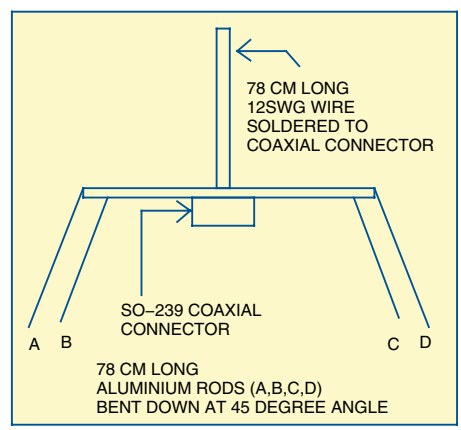


Fig. 2: Installation of aluminium rods for the antenna

'Spot An Error' Award Winner

In 'Assistive Device for the Speech Impaired,' article published in October issue, in the third paragraph under Circuit and working, the part of the sentence '…thereby avoiding interferences from the commercially-available receivers,' is wrong. The transmitters nearby will cause interferences, not receivers.

Allen Mathew

A half-wave dipole antenna can also be used for the sake of simplicity. Use a 75-ohm coaxial cable to feed the dipole and a 50-ohm coaxial for the ground plane antenna. The ground plane antennae for FM band are readily available from China on eBay.

Bed Vacancy Alarm

In 'Bed Vacancy Alarm System' DIY article published in September issue, on page 102, ATmega328 with bootloader is mentioned in parts list and also in PCB, but ATmega328P is mentioned in the text. This is confusing because ATmega328P and ATmega328 have different signatures.

Also, in the PCB layout, footprint and symbol of Schottky diodes (1N5819) are wrong. It should be DO-41 package. And, LED2 is shown in green colour in circuit but in the PCB it is red.

Rakesh P.
Through email

The author T.K. Hareendran replies:

The project was based on ATmega328P with pre-burned Arduino bootloader. As per the datasheet, ATmega328 has a device signature of 0x1E 0x95 0x14 and ATmega328P of 0x1E 0x95 0x0F.

Another difference is the process technology where P indicates pico-Power technology and is best suited for low-power applications.

Normally, Arduino IDE does not differentiate between the two (with P and without P) when doing the serial programming. But if you are burning the bootloader, keep an eye out for this difference. Arduino Uno uses Atmega328P-PU as the original chip.

EFY. Thanks for pointing out the mistakes in the PCB layout and LED colours!

AS9100C Certified Distributor

mouser.in

The Newest Products for Your Newest Designs®

Call Mouser before your boss calls you.

With Mouser, your emergency is our emergency. We work hard to make sure you always get what you need, when you need it.

Our local tech support and customer service experts around the globe are always there to help you out. So relax, and rely on Mouser for all of your component needs.

"Larry has been extremely helpful with all my orders especially my latest order, which was a 50 line item order that I needed ordered immediately which he successfully did. Thanks!"

Lamont

Customer since 2005

Awarded for Global Customer Service Excellence
NorthFace ScoreBoard Award
★★★★★

MOUSER ELECTRONICS.

Worldwide leading authorized distributor of semiconductors and electronic components

+91 80 4265 0000
india@mouser.com

Things You Wanted to Know!

Q1. What are the advantages of using microcontroller (MCU) development boards like Arduino, Raspberry Pi and Beagle Bone?

Pamarthi Kanakaraja
Asst. professor, Andhra Pradesh
Through email

A1. An MCU is a standalone single-chip integrated circuit that contains a central processing unit, read only memory (ROM) to store the program, random access memory (RAM) to store variables used in the execution of the program and various input/output (I/O) buses like SPI, I2C and UART to connect to the outside world.

As compared to MCUs, an Arduino simplifies the amount of hardware and software development needed to get a system functioning. Arduino platform is designed to give the user complete control of hardware. On software side, it provides a number of libraries to make programming the Arduino easier. Simplest of these are functions to control and read I/O pins rather than having to fiddle with bus/bit masks normally used to interface with Atmega I/O. By using Arduino integrated development environment, you can write programs that can interface with almost limit-less hardware including switches, sensors, LCDs, other MCUs, the Internet and so on. Arduino hardware and software is open source, and the designs and software can be used to make projects.

Devices like Raspberry Pi and Beagle Board are designed to function on a much higher level. With already integrated hardware that takes care of things like the ethernet, video and audio processing, large quantities of RAM and an almost unlimited amount of storage space, these are really mini-computers. You can run complete operating systems (OSes) like Linux and Android and develop programs within those OSes that can control system functions and I/Os that are made available.

Q2. What is the difference between Bluetooth module (BT 24, BT 53 and HC 05) and Bluetooth dongle?

Sachin Ambesange
Latur, Maharashtra
Through email

A2. Bluetooth is a standardised protocol for sending and receiving data via a 2.4GHz wireless link. It is a secure protocol and is perfect for short-range, low-power, low-cost, wireless transmissions between electronic devices.

Bluetooth modules (Fig. 1) like BT 24 and BT 53 are Tx–Rx pair modules from Amp'ed radio frequency technology. These are used in applications that require basic Bluetooth functionality. Their hardware is based on Cortex-M3 and Cortex-M4 microprocessors, respectively. Their radio classification is Class 2 and Class 1, respectively. Radio classification is based on the range of transmission and maximum transmitted power. Maximum range of transmission in Class 1 is about is 100m, whereas the range is limited to 10m in case of Class 2 radio. Both are SPI and I2C compatible.

Fig. 1: Bluetooth module

Fig. 2: Bluetooth dongle

HC-05 module (Fig. 2) is Bluetooth serial port protocol module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is a fully-qualified Bluetooth V2.0 + EDR (enhanced data rate) having 3Mbps modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single-chip Bluetooth system with complementary metal-oxide semiconductor technology and with adaptive frequency hopping feature. It has a footprint of 12.7mm x 27mm. It aims to simplify the overall design/development cycle.

So bluetooth modules can be used as electronic devices by the user as per requirement.

Bluetooth dongles are USB network adaptors that allow a computer to communicate with Bluetooth devices such as mobile phones, mice, keyboards, remotes and headsets. Dongles are meant for short-range wireless networking, typically within 10m (33-feet) or less. If you move too far from the dongle, connection to the computer either becomes slow or unavailable.

Q3. Is it possible to make an induction heater just to produce enough heat to cook food by modifying the circuit of a household inverter? If possible, please send the procedure and modifications to make it.

Soumik Dutta
Dibrugarh, Assam
Through email

A3. Yes, it is possible! A power inverter is required to change DC power from the battery, which is usually 12V or 24V, to conventional mains alternating current AC power at 230V. This means that you can use the power inverter to operate all kinds of domestic electrical appliances including an induction heater.

Normally, an induction heater/cook-top consumes energy in the range of 1.8kW to 2kW. Most household inverters are capable of producing this required energy. Simply connect the inverter to a battery and plug the induction heater into the inverter. The inverter draws its power from the battery, which needs to be recharged. The battery can be recharged by a generator, solar panels or a battery charger plugged into an AC outlet.

Answers compiled by EFY senior application engineer, Nidhi Kathuria. Letters and questions for publication may be addressed to Editor, Electronics For You, D-87/1, Okhla Industrial Area, Phase 1, New Delhi 110020 (e-mail: editsec@efy.in) and should include name and address of the sender

High Voltage MOSFET

(VDSS=800V) DTMOS IV Product Lineup

TOSHIBA
Leading Innovation >>>

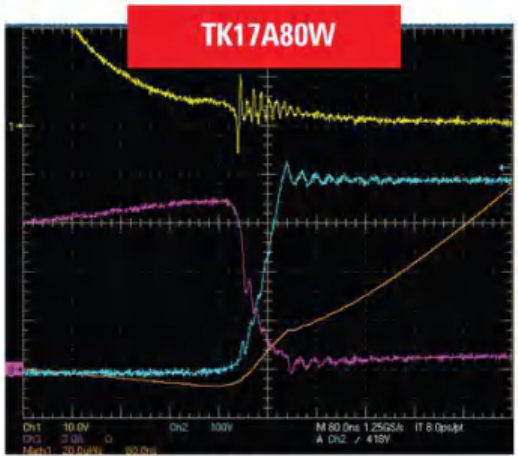
I_D (A)	$R_{DS(ON)}$ MAX (Ω)	DPAK (TO-252)	IPAK (TO-251)	TO-220	TO-220SIS	Q_g Typ.	C_{iss} Typ.
3	4.9	TK3P80E				12	500
4	(3.5)				TK4A80E	15	650
5	(2.4)				TK5A80E	20	950
6	1.7				TK6A80E	32	1350
5.5	1.05	TK6P80W	TK6Q80W			10	630
10	1.0				TK10A80E	46	2000
9.5	0.55			TK10E80W	TK10A80W	17	1070
11.5	0.45			TK12E80W	TK12A80W	23	1400
17	0.29			TK17E80W	TK17A80W	32	2050

ES available

Under MP

(1)For Wide Range Output
< 60W - TK6A80E
60W-100W – TK10A80E
100W – 150W – TK12A80W
150W – 250W – TK17A80W
using PWM soft switching converter (ZVS)

(2)Fast Switching
Useful for High Efficiency Power Supply



Example of turn-off Waveform
VDD=400V,ID=7A,Inductive load, Rg=62Ω

TOSHIBA
Leading Innovation >>>

Semiconductor & Storage Products

Contact at: Arun Kumar : +91-9810121489, Email: arun.kumar@toshiba-india.com
Website: http://www.toshiba.semicon-storage.com/

Learning **Robotics**

Robotics is the combination of mechanical, electrical, electronic engineering and computer science. It deals with the design, construction and operation of robots. This month we have a few online resources that would help you learn more about robots and robotics

NIRAJ SAHAY

robotics.org

Robotics Online is sponsored by Robotic Industries Association. It provides information to help engineers, managers and executives apply and justify robotics and flexible automation. The website includes a buyers' guide with a search engine function plus industry insights, daily news updates, case studies, technical papers, event calendar, job openings, an Ask the Experts forum and much more.

www.robotics.org

spectrum.ieee.org

IEEE Spectrum magazine is the flagship publication of IEEE, the world's largest professional technology association. It is a monthly magazine for technology innovators, business leaders and the intellectually curious. *Spectrum* explores future technology trends and the impact of those trends on society and businesses. Its website has a section on robotics, contents of which have been divided into different categories such as DIY Robots, Artificial Intelligence, Home Robots, Humanoid Robots, Robotics Software, Industrial Robots, Medical Robots and Military & Space Robots. The website can be used for reference or learning new ideas.

www.spectrum.ieee.org/robotics

robotshop.com

RobotShop is the world's leading robot store for personal and professional robot technology. Here you will find a selection of personal, professional, educational and toy robots. The website has a section on learning robotics called GoRobotics. It is the ultimate destination for learning about robotics. You can get busy learning how to make robots with the available educational content. You can browse the website and learn how to build simple to complex robots.

www.robotshop.com/blog/en/robots/gorobotics

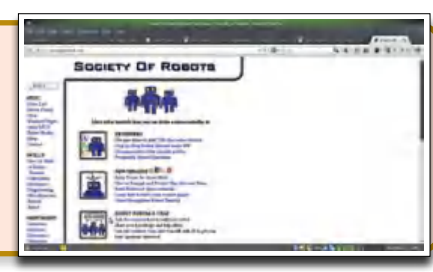
RoboticsCourseWare.org

RoboticsCourseWare.org is a free and open educational resource for faculty, students and self-learners throughout the world. This site was developed based on feedback from many of the world's top academics working in the field of robotics that there existed a need for an open repository of robotics course material in order to better coordinate the teaching of robotics across universities. *RoboticsCourseWare.org* was formally developed by Aaron Dollar, Daniela Rus and Paolo Fiorini, with two grants from IEEE Robotics and Automation Society under its New Initiatives programme.

www.roboticscourseware.org/courses.html

societyofrobots.com

The website is one of the best places to learn how to make a robot. There are several tutorials on building robots. It also has a discussion forum that has 11,600 plus members discussing around 17,500 topics on robotics. There are approximately 121,000 posts in the forum.



www.societyofrobots.com

R&S®Spectrum Rider FPH

Small form factor to handle big tasks

The new handheld spectrum analyzer from Rohde&Schwarz:

- Capacitive touchscreen like a smartphone
- Longest battery life (8 h) meets lightest weight (2.5 kg)
- Measurements with confidence in the lab and in the field

Want to know more?
Visit: www.rohde-schwarz.com/ad/spectrum-rider
Email: sales.rsindia@rohde-schwarz.com

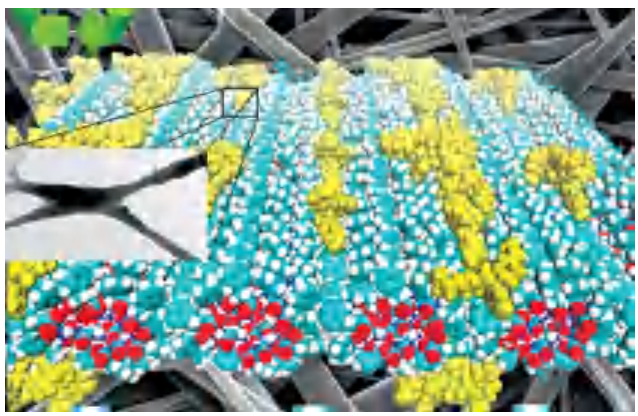
ROHDE&SCHWARZ

A-27 Mohan Co-Operative Industrial Estate, Mathura Road, New Delhi-110044, Phone: +91-11-42535400, Fax: +91-11-42535433
Bangalore: +91-80-41780400 I Hyderabad: +91-40-40003200 I Mumbai: +91-22-26743848

TECHNOLOGY AT YOUR SERVICE

Researchers develop biodegradable displays for electronics

Researchers at University of Missouri, USA, are on the verge of creating biodegradable electronics by using organic components in screen displays, which could help reduce electronic waste in the world's landfills. According to Suchismita Guha, professor in Department of Physics and Astronomy at MU College of Arts and Science, "This discovery creates the first biodegradable active layer in organic electronics, meaning, in principle we can eventually achieve full biodegradability."



A theoretical simulation of the distribution of the polymer on peptide nanotube and an electron microscopy image of the nanocomposite (Image courtesy: www.phys.org)

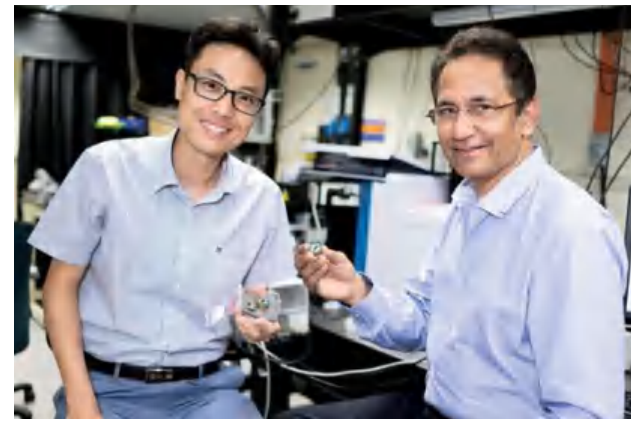
Guha, along with graduate student Soma Khanra, collaborated with a team from Federal University of ABC (UFABC) in Brazil to develop organic structures that could be used to light handheld device screens.

Using peptides, or proteins, they were able to demonstrate that these tiny structures when combined with a blue light-emitting polymer could successfully be used in displays. The scientists also discovered that by using peptide nanostructures, they could use fewer polymers. Using less to create the same blue light means that nanocomposites achieve almost 85 per cent biodegradability.

Scientists develop super-sensitive magnetic sensor

A hybrid magnetic sensor that is over 200 times more sensitive than most commercially-available sensors has been developed by scientists. This paves the way for the development of smaller and cheaper sensors for various fields such as consumer electronics, information and communication technology, biotechnology and automotive.

When an external magnetic field is applied to certain materials, a change in electrical resistance called magnetoresistance, occurs as electrons are deflected.



Researchers from National University of Singapore (Image courtesy: www.phys.org)

The sensor developed by the team led by associate professor Yang Hyunsoo from National University of Singapore, is made of graphene and boron nitride, and comprises a few layers of carrier-moving channels, each of which can be controlled by the magnetic field. The scientists characterised the sensor by testing it at various temperatures, angles of magnetic field and with a different pairing material.

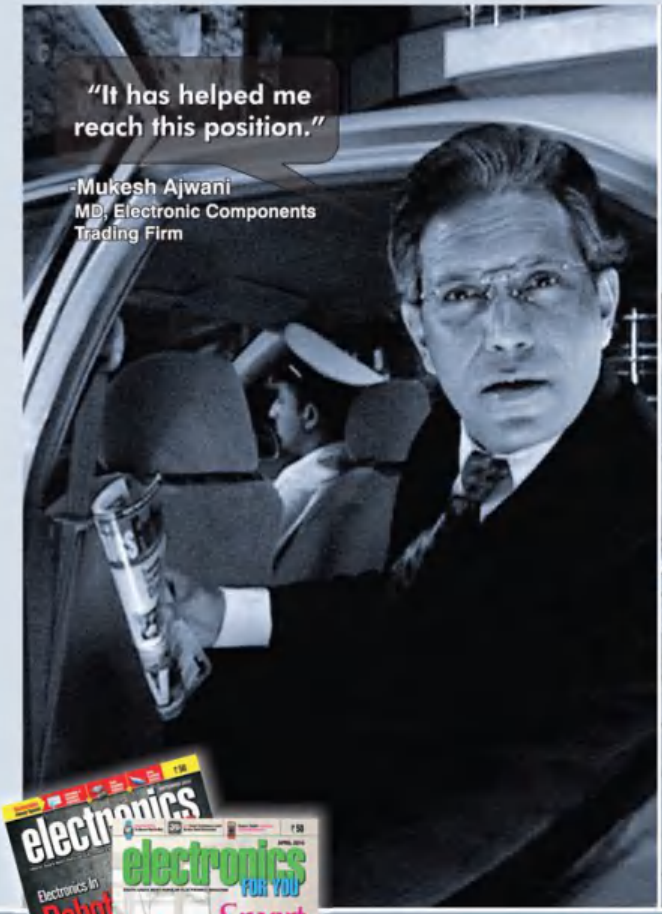
MIT researchers use Wi-Fi signals to capture human figure through walls

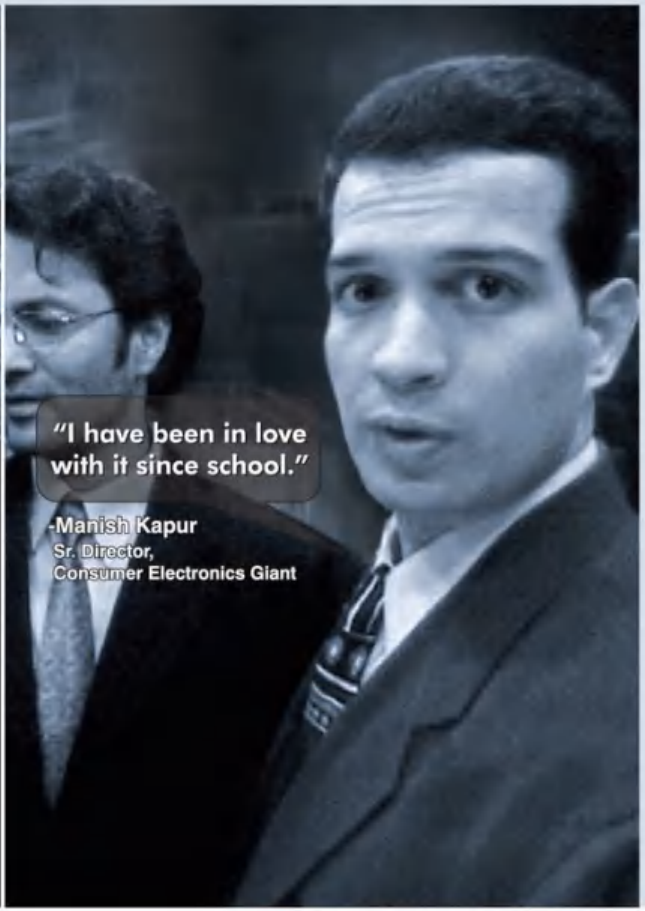
In 2012, researchers at University College in London used a modified Wi-Fi router to detect people through walls. Now, in 2015, researchers at Massachusetts Institute of Technology's (MIT's) Computer Science and Artificial Intelligence Lab have taken the concept forward and developed RF-Capture that not only detects human beings across walls but is also capable of recreating silhouettes from which it would be possible to distinguish people in a room based on their physical characteristics.

RF-Capture has been developed to create a rough image of the individual across the wall and even monitor

RF-Capture transmits wireless signals and then analyses those reflections to piece together a human form (Image courtesy: www.theverge.com)

PIONEERS IN TECHNOLOGY. PARTNERS IN SUCCESS.





Mr Kapur, Mr Ajwani and Mr Verma are not the only ones who owe their success to *Electronics For You*. The technology magazine that started off in 1969 is today South Asia's most popular one. Covering the latest on emerging technologies, changing industry trends, evolving trade practices...

Not surprisingly, top decision makers and those high up on the corporate ladder in the electronics fraternity treat EFY as their Bible.

- **Over half a million readers**
- **India's largest selling technology magazine**
- **Caters to the entire electronics fraternity**

EFY GROUP
Technology Drives Us

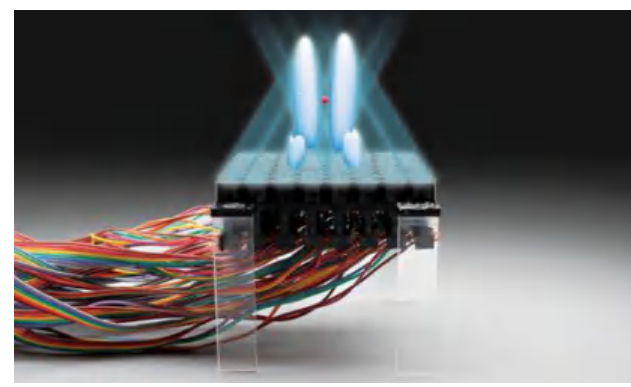
D-87/1, Okhla Industrial Area, Phase 1, New Delhi-20 • Ph.: 011-26810601/02/03 • Email: info@efy.in • www.electronicsforu.com

movement of limbs. It is installed on the opposite wall and is instructed to send wireless radio frequency signals (Wi-Fi) across a room. When signals hit an obstacle such as a human body, these are reflected and are captured by RF-Capture. It then takes some time before creating the silhouette because as the person walks across the room only certain parts of his/her body reflect the signal.

RF-Capture captures multiple snapshots of the person within a certain period of time and by using a reconstruction algorithm (also developed by the team) generates a rough figure of the person from which users can see physical features such as head, chest arms and feet. It can also show how a person is standing in the room.

World's first sonic tractor beam moves objects using sound waves

Tractor beams—a term coined by sci-fi author E. E. Smith—have been brought to life by researchers at University of Bristol and Sussex, in collaboration with a company called UltraHaptics. Together, they have developed the world's first sonic tractor beam that can not only lift but also move objects in thin air using sound waves.



Tractor beam rays can grab and lift objects
(Image courtesy: www.newskarnataka.com)

The tractor beam makes use of high-amplitude sound waves to create an acoustic hologram that can pick up and move small objects. Not only does the technique manipulate objects suspended in air, these also defy gravity. These control several dozen loudspeakers individually so that an acoustic hologram is created to manipulate different objects in real-time without any physical contact.

The researchers used 64 tiny loudspeakers that created high-intensity, high-pitch sound waves. The tractor beam surrounded the object that had a high-intensity sound and therefore created a force field that held the object in its place. By controlling sound waves, the team could rotate, move or hold the object almost instantly.

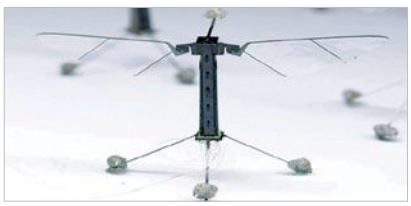
The team has demonstrated three different types of acoustic force fields that can work as tractor beams, which include an acoustic force field that looks just like a pair of fingers or tweezers, an acoustic vortex where

objects are stuck-in and trapped at the core and a high-intensity cage that envelopes an object and holds it in place from all directions.

RoboBee, a tiny robot that can fly, swim

Scientists have designed an insect-like robot, smaller than a paperclip, that can both fly and swim, paving the way for future dual aerial-aquatic robotic vehicles.

The biggest challenge was conflicting design requirements. Aerial vehicles require large airfoils like wings or sails to generate lift, while underwater vehicles need to minimise surface area to reduce drag. To solve this problem, engineers at Harvard University's John A. Paulson School of Engineering and Applied Science (SEAS) took a clue from puffins. These birds employ similar flapping motions to propel themselves through air as through water.



First insect-size robot that can fly, swim (Image courtesy: www.bravejournal.in)

According to Kevin Chen, a graduate student at Harvard Microrobotics Lab at SEAS, "Through various theoretical, computational and experimental studies, we found that the mechanics of flapping propulsion are actually very similar in air and in water."

Robot that uses artificial brain cells to navigate like a human

Behaviour and interplay of two types of neurons in the brain gives humans and other animals the ability to navigate by building a mental map of their surroundings. Now, a robot has been provided with a similar cluster of virtual cells to help it find its own way around. This work could help neuroscientists understand the functioning of the brain's navigation system.

Researchers in Singapore simulated two types of cells (place and grid cells) known to be used for navigation in the brain and enabled a small-wheeled robot to find its way around. Rather than simulate the cells physically, they created a 2D model of the cells in software.

Researchers had the robot roam around the office space, and verified that its artificial place and grid cells functioned in a comparable way to their biological counterparts.

LCD eye lens that could restore hyperopia

Devesh Mistry, a postgraduate research student at University of Leeds, is developing a new eye lens that could restore long-sightedness in older people. People above the age of 45 need reading glasses because they suffer from presbyopia, a condition that makes their eye

lenses lose elasticity and flexibility. As the lens in the eye becomes stiff, muscles near it begin to contract and cannot change the shape of the lens for bringing nearby objects into focus.

Devesh Mistry's invention needs liquid crystal (which is required for LCD used in TV monitors, smartphones and tablets), that can make the eye lenses adjust and focus depending on the eye muscle movement automatically. His research is based on developing synthetic replacements for a diseased lens in our eye, that is, intra-ocular lens implants that can bring back normal sight for the elderly.

Wearable sensors could translate sign language into English

Wearable sensors could one day interpret the gestures in sign language and translate these into English language, providing a solution to communication problems between deaf people and those who do not understand sign language.

Prototype of a wearable device that can sense movement and muscle activity in a person's arm (Image courtesy: www.mytechocean.com)

Engineers at Texas A&M University, USA, are developing a wearable device that can sense movement and muscle activity in a person's arms. It works by figuring out the gestures a person is making by using two distinct sensors: one that responds to the motion of the wrist and the other to the muscular movements in the arm. A program then wirelessly receives this information and converts the data into English.

The researchers built a prototype system that could recognise words that people use most commonly in their daily conversations. They say that once the team starts expanding the program, they will include more words that are less frequently used, in order to build up a more substantial vocabulary.

Genetically-engineered virus doubles efficiency of solar cells

Researchers at MIT have developed a genetically-engineered virus that could help solar cells generate energy with nearly double efficiency.

Plants undergo photosynthesis where these absorb sunlight and convert it into solar energy with almost 100 per cent efficiency. In the case of solar panels, even the best can only convert about 44 per cent of the absorbed light into usable energy.

One way plants achieve this efficiency is by using a concept called quantum weirdness that allows a particle to exist in more than one place at a single instant of time.

Researchers took advantage of this quantum weirdness by changing viruses' DNA, which improved the speed of excitons by more than 200 per cent and travelled at double the speed of those in existing solar cells, thus resulting in solar panels that could transmit energy with unprecedented efficiency.

Scientists develop world's first 3D blood vessel bio-printer

A Chinese company has developed the world's first 3D blood vessel bio-printer, which makes it possible to produce personalised functional organs.

According to biotechnological company Sichuan Revotek Co. Ltd, based in Sichuan Province, the breakthrough has been achieved through its self-developed stem cell bio-ink technology, 3D bio-printer and cloud computing platform.

James Kang, who led the programme, said that blood vessels that transport nutrients to organs are indispensable elements when creating any organs. His team created a novel type of bio-ink—Biosynsphere—whose primary goal is the personalised stem cell bio-printing to pave the way for organ regeneration.

3D-printed swimsuit scrubs water pollution

When most people swim in the ocean, they do not think about how they can mop up pollution as they splash around, but a team of researchers have created a 3D-printed bathing suit that could do just that.

Engineers from University of California, USA, along with designers from Eray Carbajo, an architecture and design firm based in New York City, have designed a bikini swimsuit that can absorb contaminants from water while a person swims. The swimsuit keeps the materials locked up in its fabric.

The suit has been moulded from a 3D-printed, net-like structure made of synthetic rubber and a reusable and recyclable padding made from a material called Sponge, which was also developed by the team four years ago. They were trying to create a useful technology to help clean up oil or chemical spills, or desalinise water.

They created Sponge from heated sucrose (compound found in sugarcane) that was modified on the molecular level. It is highly-porous but it is also hydrophobic, which means it does not absorb water. If you put Sponge in an oil and water mixture, it will absorb the oil but not water.

Check efytimes.com for more news, daily

LED EXPO

Visit us at Hall 12 / Isle L / Booth L01
3rd-5th December 2015, New Delhi, Pragati Maidan

Superior resins engineered for challenging environments

In Encapsulation Resins our comprehensive range meets the increasing demands of the electronics industry. Whether it's epoxy, polyurethane or silicone resin systems, our products are designed to protect and insulate printed circuit boards (PCBs) and electronic components from the threats of harsh and challenging environments.

Encapsulating the entire device in resin offers protection against moisture, vibration and rapid changes in temperature, thus offering superior performance under extreme conditions.

Whether for general purpose or tailored for individual requirements, every electro-chemical solution is within our spectrum. Our specialist approach to problems has established us as a key provider and developer to the technical electrical industry, both commercial and domestic.

Isn't it time you discovered how Electrolube can serve you?

Scan the code to discover our full spectrum of superior Encapsulation Resins and electro-chemical solutions.

+91-80-40407109
info@electrolube.in
www.electrolube.in

ELECTROLUBE
THE SOLUTIONS PEOPLE

Electronic & General Purpose Cleaning	Conformal Coatings	Encapsulation Resins	Thermal Management Solutions	Contact Lubricants	Maintenance & Service Aids

HK WENTWORTH (INDIA) PRIVATE LIMITED. Private Office 109, DBS House, #26, Cunningham Road, Bangalore 560052, India

Some Projects **Using Wearable Devices**

Rohan B. Rebello
is a senior undergraduate at Faculty of Mechanical Engineering, College of Engineering, Pune. This article was penned down by him during his internship at MIT Media Lab REDx programme

The rising rate of pollution, tardiness and a couple of other issues has led to numerous health issues, in particular, cardiac issues, asthma and dental issues, which are posing to be life threatening and life deteriorating. Besides, we often encounter issues like imbalance in stress levels, emotional outbursts and physiological and emotional breakdown. So the trend is moving towards the creation of heathcare products to ascertain symptoms and preliminary signs of any disease or disorder.

One of the major steps taken in this regard is by Massachusetts Institute of Technology Media Lab's REDx programme, where students and working professionals devote their time and effort towards building prototypes in the healthcare sector. The main aim is to deploy these devices in India, hence the projects worked on by the teams are customised according to the problems faced in India.

Every year MIT REDx camps take place in Mumbai, Hyderabad and Nashik, usually in the month of January. MIT REDx was founded and is being nourished by MIT Media Lab's Camera Culture Group, headed by Prof. Ramesh Raskar and mentors from the institute. Getting inputs from various doctors, hospitals and Internet sources has helped the teams to set goals for their respective projects and work in this regard. A brief of the prototypes being built is outlined in this article.

SkinSpect. This project aims at accurate primary detection of skin cancer. However, its main purpose in India is to spread awareness about skin anatomy, skin topography and various other dermatological domains.

MIT Health Tech Camp 2015, Mumbai

Project DaAnt. It aims at detecting dental issues like pain in gum cavity, eating patterns by recognising facial and chewing patterns and much more.

Project Cardio24. This project is aimed at detecting cardiovascular problems at an early stage. The user wears a belt around chest, which records ECG signals more precisely as it is placed near the source. Data is transferred wirelessly to an online portal accessible by both the doctor and anyone having access to the patient's account. An algorithm then verifies any irregularity in the ECG pattern to indicate various disorders, which is an early-warning sign.

Project LightEar. This project is aimed at providing information regarding detection signs of ENT-related disorders by 3D imaging the ear. Conventionally, the ENT specialist looks into the ear of the patient for check-up. But this method has been proven inaccurate and tedious, especially when it comes to checking a child's ear. This project eradicates such issues as it uses a device that looks like a headphone and is user-friendly.

Project ARAM. The project is aimed at providing data about a person's sleeping patterns and various other parameters that are recorded during a full sleep cycle. This data is crucial in providing information, specifically about heart and lung disorders. Some people suddenly wake up gasping for air during their course of sleep, which is very unhealthy. By using the database created, this project may reveal many things you were not aware of.

Project SenseCam. The project recognises facial expressions and can be used to detect moods, emotional stress levels and physiological and psychological aspects. It can be used in prisons, hospitals and colleges, to name a few places, to study the various factors concerning human behaviour.

The projects mentioned above are under development and could soon be available in the market, and may or may not need approvals based on their use in India.

From my point of view, I think it is very essential to provide basic medical education in all domains such as engineering, commerce and so on. A good example would be Applied Biology course, which has been made compulsory at College of Engineering, Pune. Initially, I felt it was useless but it proved to be a good combination with engineering as health is a primary concern in all areas of life.

GOGREENUNSTOPPABLE

Technology, innovation & varied application are evolving dynamically as ever before, reliance on the power back-up has multifolded hence the renewable energy source has become need of the hour. BB's next generation & ever reliable range of VRLA & Gel batteries are the most preferred by the stringent world technology leaders. Now be assured no matter whatever the application be, your concentration will only have to be on your job and the responsibility of keeping everything powered automatically rests on us.

- STANDBY APPLICATION
- CYCLIC APPLICATION
- TELECOM APPLICATION
- RENEWABLE APPLICATION

INDIA & SAARC: B&B BATTERY (INDIA) Co. Private Ltd.

 # 88, 3rd Main, Dollars Colony, 4th Phase, J P Nagar, Bangalore – 560078. INDIA
T: +91 80 2649 6670, 2649 6680 • W: bb-battery.com • E: indiadmin@bb-battery.com

BB®

Start a Change

Augmented Reality: **Where It Starts**

Santhosh is a hobby electronics engineer and technology enthusiast. He has interests in cameras and augmented reality

Ever wondered how in Star Wars holographic projections were made for transferring messages? And in Iron Man, where Tony Stark plays with his hi-tech interactive laboratory, designing his super-cool suits and weapons? In both the movies, virtual projections were interacting with real-world characters—this is augmented reality (AR).

AR's application in everyday life is on the rise. For example, when you take a photo on your mobile phone of an unknown object, there exists an application that tells you what that object is. How does this happen?

For this to happen, there should be something that interacts with the real world and serves as a bridge to the processor. This is usually done by a camera.

Now, this is an area where AR is made use of. There are some highly-advanced systems built recently, which can view the real world as people do, calculate the distance of each object that surrounds the system, help people build real-world objects using 3D printing by using perceived data, understand where and in what position the device holder stands, among other things. Three examples for such systems are Google Glass, Meta Augmented Reality glasses and Oculus Rift. This article explores the hardware used in these systems, which primarily act as a source that interacts with the real world.

Whenever you take a photo using a mobile phone or digital single-lens reflex (DSLR) camera, the image that is formed is in 2D format. Speaking from the perspective of the camera itself, it does not understand the scene in 3D, as people do. This is because the scene is caught using a single camera.

From a science perspective, in order to perceive the depth, or 3D sense, two cameras are required. This is achieved by a specialised camera called stereo camera.

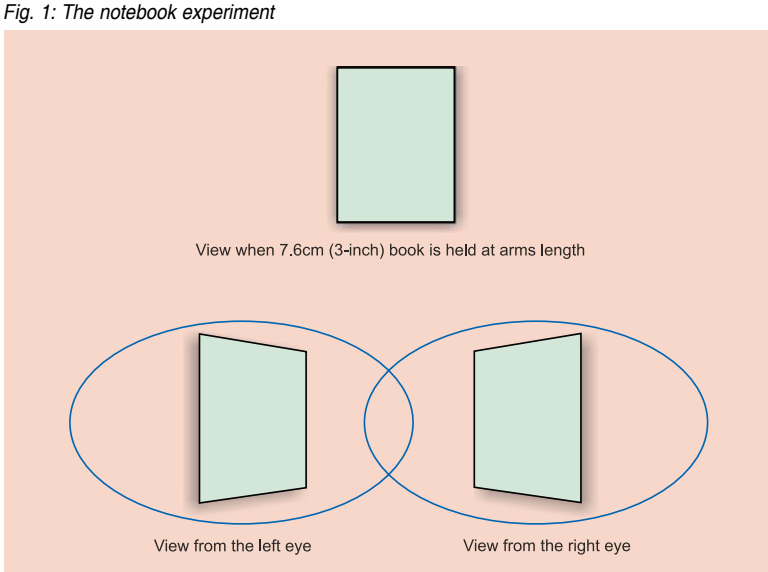
How the stereo camera works

The rudimentary principle of a stereo camera is binocular vision, which is the exact same principle a human brain applies to perceive its surroundings. Speaking of human beings, we have two eyes, with some distance in between, which is called interocular distance. Each retina produces a slightly different image of the same object. This is the primary reason why we are able to see things in 3D. If we possessed a single eye, understanding depth would be nearly impossible.

Consider Fig. 1, where a small notebook, when looked at using both eyes, will look perfectly rectangular with an accurate sense of depth in it. But if the same notebook is held at an arm's distance and viewed using, say, the left eye alone, then the middle part and the extreme-left edge could be viewed. Similarly, when viewed using the right eye alone, the right edge would be visible. When the notebook is viewed using both eyes, the brain stitches the images from both the retinas and renders a beautiful 3D view of that same.

Note that, this is the reason why in 3D cinemas, without using 3D glasses, pictures and characters get misaligned

Fig. 1: The notebook experiment



sanwa®

ADVANCE TECH®
Since 1996
An ISO 9000:20008 Company

GET 3 YEARS
Replacement Warranty*

- Multimeter Digital /Analog
- Clamp Meter
- Clamp Sensor
- Insulation Resistance Tester
- Hybrid Multimeter
- PC Link Multi Meter
- Lux Meter
- Optical Power Meter
- Laser Power Meter
- Tachometer
- Earth Tester
- Phase Detector
- LCR Meter

DISTRIBUTORS REQUIRED FROM ALL OVER INDIA

* Terms & conditions apply

PLEASE VISIT OUR WEBSITE FOR WIDE RANGE OF INDUSTRIAL SOLUTIONS

ADVANCE TECH SERVICES PVT. LTD.

(An ISO 9001: 2008 Certified Company)
PH: +91-11-47002024 upto 27 E-mail: info@advancetechonline.in
Web: www.advancetechonline.in

• NEW DELHI • PUNE • AHMEDABAD • BANGALORE • HYDERABAD • CHENNAI

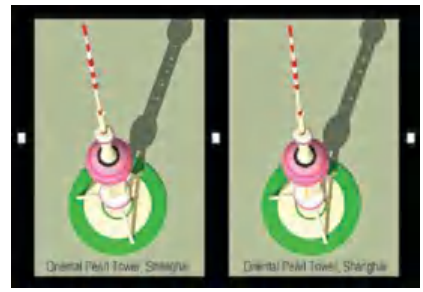


Fig. 2: A set of stereoscopic images

In a stereo camera, there are two streams of data bits originating from two cameras. The complexity arises here. There are two image sensors focusing on a single object and the expectation is that, these two image sensors produce exactly the same output, meaning, the same stream of bits. But since the two cameras are separated by some distance, even though both cameras focus on the same object, there is a slight difference in both sets of outputs. Fig. 2 shows such a set of images captured using a stereo camera.

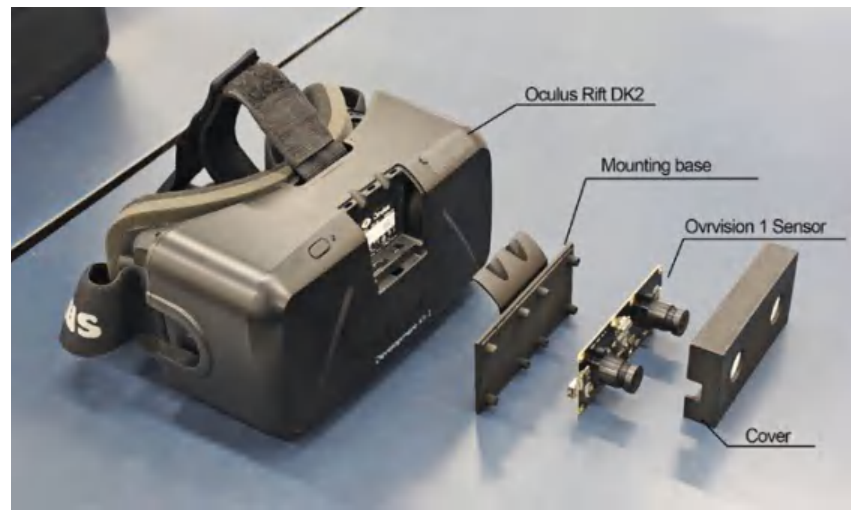


Fig. 3: Oculus Rift setup

These two different streams of output are then fed to the processor, which accepts stereoscopic inputs. Note that, not all processors available in the market support stereo input. The processor treats this difference between the two images and, using depth-perceiving algorithms, calculates the depth or the distance at which that particular object is placed. This is the simple working principle of a stereo camera, which is used in a system like Oculus Rift, whose complete setup is shown in Fig. 3.

While stereo cameras are a great source for 3D images or videos, these are not the only source using which 3D recreation is done for AR. Another interesting way of recreating 3D images is using a concept called time of flight (ToF). ●

with two different colour bases (cyan and red). This essentially explains the science behind the working of a stereo camera.

Constructing an image

Based on the above principle, a stereo camera is designed to perceive depth using two cameras. These cameras are separated by a distance called baseline, which is nothing but the interocular distance. Usually this distance varies anywhere between 55mm and 85mm.

A camera is nothing but an image sensor, which actively converts light into electrical signals. This is basically analogue-to-digital conversion, and a single frame of image that is captured is converted into a stream of bits.

There are many ways in which these bits are delivered from the image sensor. A few examples are parallel interface, low-voltage differential signalling (LVDS), MIPI interface and HiSpi interface.

It's not the survival of the fittest...
...It's the survival of the fastest.

LWI Electronics Inc.

We also buy OEM excess materials. Please send your offers.

- We have a network of world's top semiconductor distributors for mil, industrial and obsolete parts

Independent Distributor of Choice for your Semiconductor and IT Needs

- Your fast and reliable source of technical products/semiconductors of all reputed makes
- All sorts of ICs (mil grade, industrial/ obsolete parts), chips, transistor, diodes, resistors, capacitors, connectors and defence electronics components on ex-stock basis
- We have full range of AT&T paradyne modems and software networking products

Speed
Service
Quality
Reliability

LIVE WIRE Electronics

ISO 9001:2008 COMPANY

QUALITY 100% ASSURED

LWI Electronics Inc.
62, 14th Cross, I Block, R.T. Nagar, Bangalore 560032, India
Tel/Fax: +91-80-23530578, 23540578, 23633578, 23541578, 23541579
Branch Office Fax: +91-80-23539578
Cell: +91-9844048366, 9901499900, 9844003611, 9901199900
Email: sales@livewireinfo.com
www.livewireinfo.com

For jobs/career contact: hr@livewireinfo.com

Live Wire Group: World Sourcing

SensAiry: A Health Tracker for Cars

Dilin Anand is a senior assistant editor at EFY. He is B.Tech from University of Calicut, currently pursuing MBA from Christ University, Bengaluru

SensAiry solves a problem that might seem simple at a superficial level but eventually ends up causing a significant amount of trouble to millions of people. If you were looking at an elevator pitch for SensAiry, it could be this: "It enables people to check their vehicles' tyre pressure and temperature using a smartphone."

Prabu Surendra, CEO, Tymtix, whose team built SensAiry, says that research has shown that vehicles with under-inflated tyres are three times more likely to be involved in a road accident. "Yet, people do not check the tyre pressure as often as they should. One reason could be to avoid the hassle of going to a service station and waiting in queue to get the tyre pressure back up to the recommended manufacturer specified levels," he says.

Petrol-heads could be early adopters

If you are a car or bike enthusiast, you will know how important it is to maintain the optimal tyre pressure and temperature to maximise traction. SensAiry eyes and ears, so to say, are a temperature and pressure sensor packed together. The rest of the device focuses on gathering data and comparing it to set thresholds programmed into the firmware to make the decision as to whether there is a problem that the user should know about.

SensAiry device

The device uses a coin-cell battery and works on a 2.4GHz frequency, which enables a longer coverage for the device while measuring up to 150psi at almost 10,000rpm.

Under normal conditions, it collects data and transfers it to the smartphone running SensAiry app, where the user can go through the information presented on it. However, if there is a situation involving, say, a heated-up tyre or a puncture, the device sends out notifications to the driver so that she or he can do what is necessary.

The best part is that, what comes after the device gathers a lot of data."For example, let's say there is a very small puncture on a car tyre. Users would not be able to see the tyre pressure variance over a period of a few days, but the app collects data and can alert vehicle owners to these minor punctures that are not obvious to them," explains Surendra. The product also lets you track multiple vehicles simultaneously.

Essentially, what they have done here is data visualisation and analytics on tyre and pressure data. It is somewhat similar to what the billion-dollar company Jawbone has famously done with their UP series of bands.

Another element that will be included in future models is shock detection. An accelerometer that senses shocks caused due to bumps and road problems will help users better estimate and even elongate the life of the tyre by making sure they are taking care by keeping the tyre properly inflated. It will also help them properly maintain the tyre pressure during dry and rainy months when it is recommended to slightly decrease or increase the pressure to maximise performance.

The accelerometer can also help users judge the performance of the suspension setup. If they have spent a bomb on getting Koni, Bilstein or Tien shocks for their cars, they can use this app to follow up on the installation to track how shock-data changes for the car while running on the same strip before and after suspension upgrade.

What Surendra is more excited about is the potential to use the data flowing in

SM Electronic Technologies Pvt. Ltd.

An ISO 9001 : 2008 Certified Company

NEXT GENERATION LOW COST LED DRIVER SOLUTIONS FOR LIGHTING APPLICATION

Solar Charge Controller+LED Driver
10W - 50W

Intelligent Lighting Solutions

Smart Lighting Control

DALI Solution

Astronomical Timer

Automotive Lighting Solution

DRL

TAIL Lamp

IoT for Lighting Solution

Lighting Control with WiFi

LED Driver Solutions for Bulb
5W, 7W, 9W, 12W
(With Inbuilt 650V MOSFET)

Solar Charge Controller
120W

LED Driver Solutions for Tube Light
9W-18W T8/T5
Isolated & Non-Isolated

Motion Sensor Solution
Panasonic PIR based

High Wattage LED Street Light Driver With 2-Stage PFC
60W - 120W

LED Driver Solutions for Down Light/Street Light
9W - 60 W

Visit Us at:

LED EXPO

Stall No. E-34, Hall No. 11

3th-5th Dec'2015,
Pragati Maidan, New Delhi

RENESAS | ROHM SEMICONDUCTOR | Diotec Semiconductor | TOREX | Panasonic ideas for life | SII | ALPHA & OMEGA SEMICONDUCTOR | GainSpan

SM Electronic Technologies Pvt. Ltd.
#170, 5th Main, 9th Cross, RPC Layout,
Vijayanagar 2nd Stage, Bangalore-560 040
Ph: +91-80-23301030 (5 Lines), **Fax:** +91-80-23387197
Email: sales@mysmindia.com

GS Technology Pte Ltd.
Block 5012, Ang Mo Kio Avenue 5,
#05-05, Techplace II, Singapore - 569876
Tel: +65 - 6483 2920, **Fax:** +65 - 6483 2930
Email: gstec@cyberway.com.sg
Website: www.gstec.com.sg

WE UNDERTAKE SERVICE/REPAIR OF LED DRIVERS

Bangalore	Singapore	New Delhi	Ahmedabad	Pune	Hyderabad	Chennai	Mumbai
+91 98863 77570	+65-6483 2920	011 - 2510 1136	+91 98107 15377	020 - 2528 3387	040 - 2717 6676	044 - 2474 6727	+91-9920592990

Tymtix team (left to right): Jyoti Chauhan, Vinayak Hegde, Mahesh T., Kalaiselvan Vallal, Banuja Nayak, Yuvaraj Tana, Prathima D., Tejas J., Veena Putham, Vipin E., Aparna Rajan, Prabu Surendra, Ragavendiran E., Kailash Dahiya and Krishnaveni

from a large number of SensAiry-enabled vehicles to judge the road conditions of different cities. This idea has the potential to change the way we think about judging road quality in cities.

How it stacks up to the alternatives

There are a lot of alternative tyre pressure-monitoring systems (TPMSes) in the market where they connect a gadget on the tyre and a small display is mounted on the dashboard through which you can see data on tyre pressure. In high-end vehicles this could be integrated to the vehicle's stock infotainment system, too. But these solutions require vehicle owners to be inside their vehicles to check tyre pressure, which is not a requirement for SensAiry.

One unique challenge that none of the existing solutions for non-luxury vehicles solve is that these do not alert you about a tyre puncture or critically-low tyre pressure until you are near the car or turn on the ignition. The problem here is that it makes the situation ripe for that unfortunate day where you are greeted by a flat tyre while hurrying to your office in a jacket and trousers.

A more significant benefit is for fleet-management companies that have long trailers or road trains with a large number of tyres at complex locations. Some might have multi-axle tyres where there are eight tyres at one point in a bus. Then there are lorries with 64 tyres—imagine the pain of installing a normal TPMS.

Design challenges

Tyres on any vehicle face some very extreme conditions, so placing your components inside these is a technically-challenging aspect of their design. In fact, some people say that this is exactly the place where an electronic system should not be installed.

Breaking out of enclosure problems. Surendra explains, "One of our earliest problems was that we were unable to fit the sensing system to properly measure pressure in a feasible way. We could get it in, through a laborious process, but it would not make sense to do it from a customer standpoint or even allow us to do a proper demonstration. So while we were trying to figure this out, one of our sensor vendor's chief research and development person invited me over and showed the facilities that they have. It was during this tour that I discovered the kind of test setup we actually needed to build the product we had in mind."

Another problem that they had was that the enclosure was built out of aluminium. Now, aluminium has this problem that it absorbs all signals due to it acting like a Faraday's cage. When they placed the sensor inside it, no signals could make their way out of the device. "The team was very disappointed when this happened," says Surendra. "While we were trying to figure out how to solve this problem, we came upon a material that had the characteristics of ABS plastic and did not absorb the signals that our device needed to transmit."

The omnipresent battery life problem. Battery life is another area where they did some tuning and revisions to come up with the perfect sauce. For instance, they designed a range extender in the device that has the consequence of reducing battery life. So what they did was modify the device so that it only activates the extender when it is really needed, like in the case of a puncture where the car needs to alert the user as early as possible.

Another event that deactivates the range extender is when the car is moving. So they used the accelerometer to figure out if the car was moving and deactivate it if it was. It also changes the frequency of testing depending on different times of the day or usage history. They eventually left the range extender out of the first version of the product to control cost, but there is a good chance that it would show up in a future version.

"Testing is one area where I am facing a challenge. Normal tyres can only handle up to 50psi of pressure, but I needed to test the sensor at 150psi to make sure it works in heavy-duty tyres. I also needed to test the sensors while running at 10,000rpm. So what I did was to get access to a dynamometer; it was pretty expensive in our case since we need to constantly try and improve the system. We are now trying to set up a custom jig to get this done. We might go for a gyroscope instead of an accelerometer for suspension and wheel-alignment issues in a future product," explains Surendra. ●

Leader Of Vacuum Technology

lotvacuum
Leader Of Vacuum Technology
www.lotvacuum.com
global@lotvacuum.com
82-31-691-3652

Since establishment in 2002, LOT has been trying to be a leader in Vacuum industry worldwide developing new technologies and innovation.

BENEFITS

- Energy Efficency
  World Class Conservation of Resources
- Industry Leading MTBF
  Simplicity of design minimizes parts and wear
- Minimal Particle Deposition
  Short Gas Path enables quick exit of particles
- Minimal Process Deposition
  Unique Temperature Control enalbles heated of cooled loads.
- Extended Bearing Life
  Split Flow Design & Simply Supported Bearings Cancel loads.
- Extended Seal Life
  Non-contact Piston Ring Labyrinth superior to shaft lip seals.

GD SERIES

DD SERIES

HD SERIES

GHD SERIES

Things You May Like to Know
About Soldering

V. Ramavallabhan
is a management and technical consultant at JVR Consultants

How should an engineer go about adopting the right soldering method? This is probably a question that most electronics engineers face at least once in their lives. The first thing that needs to be done is selecting the soldering method best suited to an application by considering the pros and cons of each soldering method, as well as the heat resistance of the surface-mount device.

Soldering methods are broadly divided into the partial-heating method and the total-heating method. While heat is applied to the components' leads and printed wiring boards (PWBs) in a localised manner in the former, the latter sees heat being applied to the entire board. This means that partial heating involves less heat stress on the device and PWB, but is unsuitable for large-volume production. Therefore this method is mainly used to correct soldering or for devices with low heat resistance.

The total-heating method is excellent in terms of productivity and running cost, but it can place considerable heat stress on the semiconductor device and board. In both cases, engineers should learn to validate the process with respect to the job they intend to carry out.

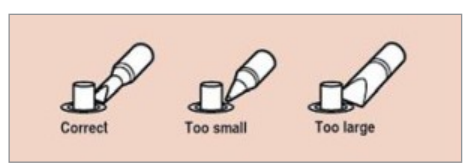


Fig. 1: Selecting the right soldering tip

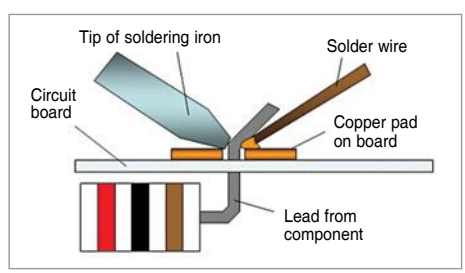


Fig. 2: Correct positioning of the solder tip

Partial-heating method: Hand soldering

Selecting the right soldering tip and iron. This is something that needs to be practically validated according to the nature of the job and components used. The job dimension and tip dimension, which is about 0.5mm to 5.0mm wide, with different types of shapes like C type (round chamber shape) or D type (flat screwdriver type), need to be selected. Proximity of other components also needs to be considered. See Fig. 1 for clarity.

Thermal effects. Controlling the soldering iron tip temperature using the controls available on the soldering equipment is not the key element in soldering. The key element is in controlling the heat cycle of the work in terms of how fast it gets hot, how hot it gets and how long it stays hot for reliable solder connections.

Engineers should also learn about process validation of the soldering process with respect to job dimension, tip dimension, solder-wire dimension and temperature. Based on validation results and the operator's speed of performing soldering, temperature should be set between the minimum and maximum range of validated temperature for a particular job.

Maintaining the soldering tips. The optimum temperature at which proper soldering takes place should be set so that overheating is avoided. When the tip is cleaned on the sponge, the sponge should have only moisture; water should not drop from the sponge while squeezing it and you should only feel the moistness. Hence, it should be moistened to that level periodically.

Solder tips should not be rubbed or sharpened with a hard surface nor should these be tapped on the table. The handle set must always be kept with the tip in the stand when not in use, preferably with the tip covered in solder. Almost every day,

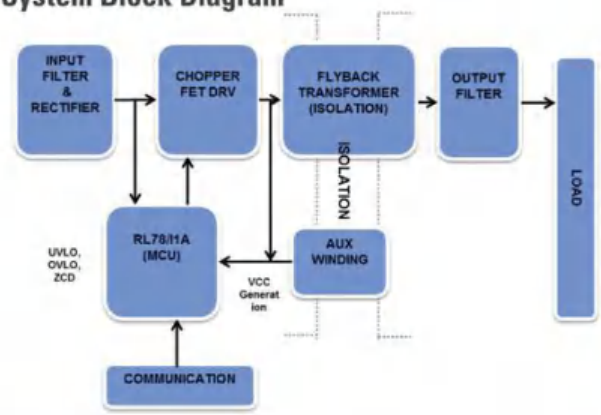
BIG IDEAS
FOR EVERY SPACE

DIGITAL POWER SUPPLY

RL78/I1A The Ultimate Power Control Microcontroller

Renesas RL78/I1A microcontrollers implements power supply control including Power Factor Correction, advanced safety and communication functions in a single chip, enabling lower cost, regulation compliance, fine dimming. RL78/I1A adopts the Renesas 16-bit RL78 CPU, which achieves both high computational performance and ultra-low power consumption, and includes 32 to 64 kilobytes of Flash memory in 20- to 38-pin packages. Safety hardware functions for IEC60730 compliance are also embedded.

System Block Diagram



Key Benefits

- Single-chip solution for power stage control.
- Variable frequency drive.
- Ultra low power consumption, high system efficiency.
- Key protection features implemented like Input Voltage (UVLO / OVLO), Output Voltage (Open load), Output short circuit.
- Supports multiple sensor & user interface controls.
- Easy integration into building automation network.
- Enables high performance intelligence power supply at low system cost.

Applications

Digital power supplies, Battery chargers etc

Device Features : RL78/I1A

- PWM High resolution with dithering (Count Clock Max 64MHz)
- Controlled in-rush current by Soft Start.
- Timer synchronous A/D capture
- Timer interlocked operation with Comparator.
- Digital Interleave PFC control function
- Enhanced Analog function
- Comparator 6ch
- Window comparator function
- PGA Amp with x4/x8/x16/x32 setting
- Hi-Z Output with Comparator TRIG

Board Specifications

- Input: 100Vac – 280Vac
- Output: 30V@1A (CCCV implementation)
- Pf > 0.95
- THD <10%
- Target efficiency > 87%
- Communication

Renesas Electronics India Pvt. Ltd.

Join us on Facebook

http://in.renesas.com

RENESAS

PWB versus PCB

Printed wiring board (PWB). The copper clad board that is unstuffed with components is known as a PWB.

Printed circuit board (PCB). When the above said board is stuffed with components and it starts functioning as a circuit, it is known as a PCB.

the tip should be removed from the element, followed by cleaning the element with a dry soft cloth and re-fitting the tip.

Reducing the occurrence of solder balls and other defects. The hot solder tip should not touch the solder wire while soldering a joint. The solder wire should be kept on one side of the job and the tip on the other side or on a different location on the job but as close as possible. This should be practiced in order to avoid the occurrence of solder balls.

Precautions. Some components, such as transistors, can get damaged by heat when soldering. It is wise to use a heat-sink clipped to the lead between the joint and component body, as shown in Fig. 3. You can buy a special tool, but a standard crocodile clip works just as well and is cheaper!

Ensuring reliable solder connections. Reliable solder connections can only be accomplished with truly-cleaned surfaces of copper pads and component leads. But usually the pads and component leads may be contaminated due to the film of oxide layer formed over their surfaces. This could cause poor soldering. Hence, before performing a soldering process, one needs to ensure the cleanliness of the surfaces.

For this purpose, fluxes are used. These consist of natural or synthetic rosins as well as chemical additives called activators. It is the function of these fluxes to remove oxides and keep these removed during the soldering operation. This is accomplished by the flux action, which is very corrosive at solder-melt temperatures and accounts for the flux's ability to rapidly remove metal oxides.

In its unheated state, however, rosin flux is non-corrosive and non-conductive and thus will not affect the circuitry. It is the fluxing action of removing oxides and carrying these away as well as preventing the reformation of new oxides that allows the solder to form the desired inter-metallic bond.

Fig. 3: A crocodile clip holding the heat-sink in place

Total-heating method: Wave soldering and SMT reflow soldering

Parameters for validation. In this process, parameters to be considered for validation are pre-heating temperature, flux (clean or no-clean flux as appropriate) level and its level of foam generation, solder combination of tin (Sn) and lead (Pb), solder level, its temperature and level of wave generation. Last, but not the least, is conveyer speed.

Pre-heating is required to avoid thermal shock and get better cleaning during flux contact, which, in turn, gets better solderability. Optimum levels of flux contacts help avoid formation of solder balls and allow for better solderability with proper wetting.

In the reflow soldering process, parameters to be considered for validation are size of the pad and selection of solder paste grain sizes. For instance, a smaller-size pad will require an appropriate amount of solder paste having solder powder with smaller particle diameters. Other parameters include temperature profiling throughout the reflow oven at different stages and the speed of the conveyor.

Profile stages of an SMT reflow process. The four profile stages of an SMT reflow process are pre-heat, pre-reflow, reflow and cooling.

Pre-heat. This phase conditions the PCB assembly before the actual reflow takes place on the pad. It removes dirt and oxides by the volatile flux action (flux compound present in the solder paste itself depends on the selected solder paste) and reduces thermal shock to the PCB assembly.

Pre-reflow. In this phase, surfaces (the pad and components) are prepared to get joined by removal of dirt or oxide layers and other impurities present in the solder paste.

Reflow. This is where the actual reflow of the solder alloy creates the mechanical and electrical bond through the formation of solder (tin-lead) and copper inter-metallic bonding.

Cooling. This phase is important because formation of the grain structure of the solder joint happens now. Most reliable solder joints are achieved by the appropriate cooling rate set by proper validation results.

Reducing the possibilities of defects. When validations are ineffective, these give rise to pin holes or blow holes, poor wetting, cracks, less or excess solder, among other issues related to soldering. Other defects are component failure due to high soldering temperature or sustained heat transfer due to low conveyor speed. However, a good visual inspection and touch-up by hand soldering can avoid residual defects after setting up a proper validated process.

Possible defects in the reflow soldering process include voids due to poor cleaning action on the pad surface and graping, which is a phenomenon that appears as poor reflow of solder particles at the top of the solder. Smaller components are also susceptible to tomb-stoning, wherein components get lifted from the pad with uneven solder paste filled underneath.

Higher temperature and long sustenance of heat makes components susceptible to component failure. This may be immediate or latent.

MAX TECHNOLOGY & CO.

MAX GOLD

AN ISO 9001:2008 CERTIFIED COMPANY

MAX 850 : SMD REWORK STATION

- Hot-Air Soldering & De-Soldering Station
- Different Nozzles to suit your needs

MAX 7805: 7-IN-1 SMD REWORK STATION

- SMD Rework Station with Synchronized Air & Temperature.
- Micro Soldering Pen.
- Battery Analyzer 1.5V to 18V DC Regulated Digital Power Supply with Reconditioning System.
- Voltage & Ampere Check with Continuity Buzzer.
- Test Speaker, Ringer & Vibrator.
- Turn ON any mobile without Battery.
- Charge your mobile battery without handset.
- Car Charger Socket for Mobile Charging.

MAX 525 : BATTERY ANALYZER (MOBILE TESTER)

- Battery Analyzer. • Micro Soldering Iron.
- Digital Power Supply with Reconditioning System.
- Voltage & Ampere check with Continuity Buzzer.
- Turn ON any mobile without battery.
- Charge your Mobile battery without Mobile Handset.
- Speaker, Ringer 8| Vibrator check.

MAX 8550 : 3-IN-1 SMD REWORK STATION

- Hot-Air Soldering & De-Soldering Station.
- Micro Soldering Station.
- 1.2V DC-18V DC Digital Regulated Power Station.
- Different Nozzles to suit your needs.

MAX 535: VARIABLE SOLDERING STATION

- 5-35 Watt Soldering Iron.
- Tip-Heating Technology.
- Multi-Bit gives you Fine Quality Soldering.
- For all types of electronic works.

MAX 550: MICRO SOLDERING STATION

- 5-15 Watt Soldering Station.
- Tip-Heating Technology.
- Multi-Bit gives you Fine Quality Soldering.
- For Dentist & Jewellery Wax Designing.
- Watch Repairing & Electronics SMD Soldering Works.

MAX 586 : PTH DE-SOLDERING STATION

- Vacuum Pump type De-Soldering tool.
- Equipped with Nozzle with Built-in heater which provides excellent thermal recovery.
- Variable heating control to suit your needs.

MAX 250: POWER SOLDERING STATION

- 25 Watt Soldering Iron.
- 2Amp/ 1.5V - 18V Digital Power Supply.
- Digital Display helps in controlling the Voltage accurately.

MAX HIGH QUALITY LONG-LIFE SOLDERING BIT/TIPS

- High Quality Long-Life Soldering Bit/Tips.
- Corrosion Resistant.
- Fine Quality Soldering.

MAX SOLDERING PEN

- 15W Soldering Pen.
- 35W Soldering Pen also available.
- Energy Efficient.
- Tip Heating Technology.

MAX SILICON LIQUID FLUX

MAX FLUX

- Non-Messy Output. No Residue on PCB.
- No Foul smell or Smoke.
- Very high Ignition Temperature - approximately 400 Degrees.
- Environment Friendly. Non Corrosive. Non Conductive.

MAX SILICON FLUX

- For Soldering & De-Soldering of all types of SMD, SMT & DIP Components.
- Environment Friendly. Non Corrosive. Non-Conductive.

366, Ahmed Mansion, 1st Floor, Lamington Road, Mumbai-7. Tel.: 91-22-2382 1313, 2384 1313, 6124 6393 Fax: 91-22-6633 3729

E-mail: info@maxtechnoindia.com, maxtechnoindia@gmail.com • Website: maxtechnoindia.com

DISTRIBUTOR: Delhi-Metro Electronic Product Tel.: (011) 2386 8195, 47508195, 23875355, E-mail: infometroq@gmail.com. • **DEALERS—Mumbai:** Skyking Agencies Tel.: (022)2388 6857/7629,2387 1582, Fax: 91-22-23860523 E-mail: skyking@vsnl.net • **Chennai** - Arihant Impex - Tel.: 044-42149893, 42131652 Fax: 91-44-42041651Precious Electronics Tel.: 044-28549095, 28549166 Fax: 91-44-28414729, E-mail: precious@md2.vsnl.in **Kolkata** - Mikado Electronics Tel.: (033) 40066064, 40066020, **Baroda** - King's Electronics Tel.: (0265) 2420538, 2420207, E-mail: kingsqline@indiatimes.com. **Kerala** - Indiatel Tel.: (0484) 2354013 **Bangalore**- Abhishek Electronics Tel.: 080-22293170 / 41140170, Email: kailashjain75@yahoo.co.in

Treasures from the **Year of Light**

Janani Gopalakrishnan
Vikram is a technically-qualified freelance writer, editor and hands-on mom based in Chennai

Lighting has come a long way, from flint stones and firewood to fluorescent lamps and now light emitting diodes (LEDs). Today, we continue to see innumerable developments in this segment, right from space and power saving to smartness and smart uses (to make other objects smart). As we draw to the end of the year, which the United Nations designated as International Year of Light and Light Based Technologies (*www.light2015.org/Home*), let us take a look at some such technologies and products.

Light for the new-age farmer

Royal Philips, a company that has been into horticultural lighting for several years now, has recently opened GrowWise City Farming Research Centre in the Netherlands for developing tailor-made LED light growth recipes that will help farmers to grow tasty, high-yielding crops indoors, all round the year. Their research will first focus on leafy vegetables, strawberries and herbs, and later branch out to find ways to grow more carbohydrate-rich crops like wheat and potatoes indoors.

The large facility is a clean and sterile environment that completely blocks off natural light and air to exercise full control over the growing conditions. It has four-layered mechanised planting racks in each of its eight climate rooms, which makes a total growing surface of 234sqm. Each plantation layer is equipped with connected, fully-customisable LEDs, including blue, red and far-red LEDs that are designed and formulated specifically for growing crops. Since LEDs are highly energy-efficient and produce less heat, these are much cooler and can be placed closer to the plants and positioned optimally for uniform illumination.

Philips' new GrowWise indoor farm will revolutionise food production (Image courtesy: www.lighting.philips.com)

This research of Philips is very crucial for future sustainability as more and more farming land is being engulfed by the expanding cities. Growing food indoors at optimal conditions with minimal effort and resources, and the ability to grow foods closer to home, will encourage more people to take up farming, too.

Controlling the functioning of humans

One of the key focus areas of this year's Strategies in Light Conference held at Las Vegas, USA, was human-centric lighting projects, designed to optimise or improve some aspects of human behaviour. Extensive research is being done around the world on how a human body responds to light exposure and how this can be used to improve the mental or physical state of a person.

The Seattle Mariners' stadium, a major league baseball stadium in Seattle, USA, for example, has fitted the home team locker room with new solid-state lighting that has features to tweak the players' circadian rhythm for optimum alertness. One of the speakers has described methods for integrating sensors into lighting systems to produce light optimised for a given activity. The non-invasive sensors automatically categorise occupants' activities and adjust the lights for performance improvement—of the person, not just the light!

Philips SchoolVision is a similar solution that helps students to focus on their work, facilitates teachers to teach better and also results in energy savings for the school. According to the time of the day and activity planned, teachers can choose between four modes that mimic the natural patterns of daylight that humans respond to. During a test, for example, Focus mode sets the light intensity to highest and the colour tone to cool, supporting focus and concen-

tration. To calm a chattering class, Calm mode sets a standard intensity level with a warm colour tone. Other modes include normal classes and energetic sessions.

Elsewhere in the world, National Science Foundation, USA, has funded a research by Brown University, Rhode Island, USA, to develop lighting systems that will influence kids' natural circadian rhythms of sleeping and waking, so they can adjust to early morning classes in school. This can also help adults, especially those recovering from health problems, to sleep better.

Mimicking sunlight

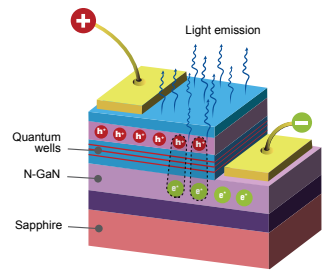
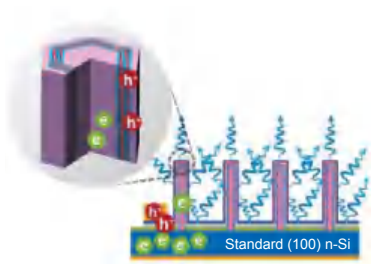
CoeLux, recently nominated by World Economic Forum as one of the Technology Pioneers 2015, has invented an artificial skylight that can light up a room's ceiling as if it were lit up by sunlight. Variants of the lighting system mimic the way sunlight appears at three different latitudes on Earth. It does this using special nano-structured materials that scatter light from the LEDs, just as tiny atmospheric particles scatter sunlight—a phenomenon known as Rayleigh's scattering.

This project is funded by the European Commission, as it promises to improve the quality of life indoors, in offices, hospitals and many other closed spaces. An organisation called Humanitas, for example, has installed CoeLux's sun-like lighting in its radio surgery department. In contrast to the darkness maintained in radio surgery bunkers to protect technicians against radiation, the cheery sunlight tends to immediately perk up patients' moods, alleviating their stress and helping them respond better to treatments.

Smartcars have smartlights

Smart lighting featured in automobiles are helping improve safety and driving comfort. One example is the new lighting system being developed by Ford. The technology combines effective spotlighting with infrared (IR) cameras to draw the driver's attention to potential hazards on the way.

Differences between Aledia's 3D LEDs and Conventional 2D LEDs

2D (planar) LEDs	3D (microwire) LEDs
	
• Small, expensive substrate	• Large, economical substrate
• Slow MOCVD growth process (high capital expenditure)	• Fast MOCVD growth process (low capital expenditure)
• High materials consumption	• Low materials consumption
• LED-specific manufacturing plants	• Existing high-volume silicon wafer fabs
• Light emission area is at most the 2D area	• Light emission area is up to three times the 2D area, which is more light/mm2 or less current density and less efficiency droop
• Single colour on one wafer	• Multiple colours on one wafer or even on one chip

Courtesy: Aledia

At a time, the IR camera can detect up to eight pedestrians, cyclists or animals on the way. An in-car screen displays the image captured by the camera, highlighting the detected objects in yellow and marking the two riskiest ones in red. The smart spotlighting system also cranks into action immediately. Moveable spotlights beneath the headlights illuminate the people or animals detected by the IR camera, casting a line along the road to make them more visible.

The same system can also be used to keep an eye on road signs, to adjust and widen the headlight beam at road junctions and roundabouts to help drivers navigate easily.

Leading the pack of smartdevices

When we speak of smart lighting, the first thing that comes to mind is connected, controllable light accessible through apps. However, light is also an enabler of smartness in other devices. One example of such a system is LiSense, developed recently by researchers at Dartmouth College, USA.

LiSense is basically a system that enables the lights in your room to recognise you and your movements, and also to autonomously control other devices to make you feel comfortable. For example, as soon as you come into your home, slump onto the couch and wave your hand, light in the living room instructs the air-conditioner to turn on and your coffee maker to start brewing.

The team uses an advanced shadow based sensing system to recognise the user's presence and gestures, and harnesses developments in visible light communications for transmitting instructions to other devices. Basically, information gets encoded as light intensity changes at high frequency, and since most current-generation smartdevices have light sensors, these are able to receive data by monitoring the changes in light. This happens very subtly and is not visible to the human eye.

According to Xia Zhou, lead author of a paper on the research, the team wants to use smartlights to turn every indoor space into a cognitive space. In the future, they hope to make the system capable of handling more than low-level gestures to monitor the occupants' behaviour, observe changes and may be even detect diseases.

Ford is developing a smart headlight system that can highlight pedestrians, cyclists and animals in an attempt to make driving at night safer (Image courtesy: http://innovationworkshop.fordpresskits.com)

Making cities safe, eco-friendly

According to a recent Navigant Research report, 40 per cent of a city's power usage can be attributed to street lighting. While this is one of the biggest reasons compelling corporations to retrofit streetlights with LEDs, the ability to make these lights smart is also working in their favour. Smart street-lighting systems offer dashboards that provide a bird's eye-view of the whole city's lighting system as well as the ability to control it. These systems also offer various ways to save power by, say, switching off and on at programmed times.

One step ahead is Philips LumiMotion lamp-post that combines a streetlight with a motion sensor to automatically switch on when someone approaches. Such smartsystems can be combined with navigational headsets for visually-impaired people to help them understand their environment in various ways, say, by reconstructing their surroundings in sound or haptic formats. This makes smart streetlights cost-effective, controllable and socially-friendly, and saves energy, too.

This means that the use of LED lights for street lighting does not end with retrofitting. Countries have to research and completely understand their potential to ensure that these benefit the society, too.

Denmark, for example, has undertaken a study at Danish Outdoor Lighting Lab, or DOLL, an industrial park outside Copenhagen, Denmark, with 9km of road and bike paths fitted with smart lighting systems from 18 companies. They are investigating options like controlling the system using iPads, making lights brighten when a vehicle or pedestrian approaches, managing parking and transmitting information about traffic, weather or air quality.

Adding a dimension to LEDs

All this smart lighting requires a lot of LEDs. The cost at which lights sell today makes it seem impossible to fit the whole world with it. So while probing a bit into the core tech, we stumbled upon a four-year-old French company called Aledia that develops low-cost LEDs with a unique three-dimensional (3D) architecture. Their special WireLED microwire technology enables the manufacture of LEDs at 25 per cent the cost of current technologies by growing high-density, coaxial gallium-nitride (GaN) microwires directly onto large-diameter silicon wafers. This can be done using existing complementary metal-oxide semiconductor (CMOS) foundries.

Aledia's technology uses economical silicon wafers with large diameters of 20cm or more and millions of vertical GaN microwires, or microrods with a diameter of less than one micron are grown on each wafer. Each of these microwires is an LED capable of emitting light from all sides. Use of large substrates significantly brings down the cost of each 3D LED, compared to today's planar ones.

Moreover, this process also involves lesser time. The advantage of being able to manufacture and package the LEDs in existing CMOS facilities does away with large capital investments, making the new technology all the more attractive.

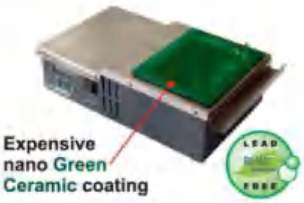
Cost aside, WireLED chips are also believed to be technically superior because these are designed to contain microwires that emit light over a broad range of different wavelengths, making it possible to produce green or red LEDs using the same material as industry-standard blue GaN LEDs. By combining different microwires on the same chip, white LEDs can also be manufactured without using phosphors.

Lighting without electricity

With the amount of research and development happening across the world, it is clear that smartlights are the future, be it at home, in industries or public places.

Much into the future, lighting might get even smarter—with priorities moving away from smartness and control to simply saving our planet. Dutch designer Daan Roosegaarde, for example, has come up with a completely off-beat approach to public lighting. Learning from bioluminescence in natural systems, he has found a way to light up a smart highway in the Netherlands using glow-in-the-dark paint as road markings. The special paint absorbs sunlight during the day to glow in the dark at night. In collaboration with State University of New York, USA, he has also developed a prototype plant containing luciferin, the compound that produces light in creatures like fireflies and jellyfish.

With his team, he is now working on developing bioluminescent street trees that will produce a soft-green glow in the dark. When streetlights are replaced with these trees, these will not only work without electricity—a fact too good to be true—but also make the highway look like a scene out of a fairy tale! ●



Hi-reliability Solder Pot
Digital Model I100-15S
Widely used in automotive industries in repeat orders

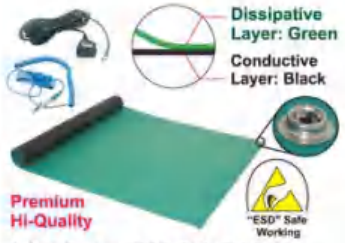
EDU2AE/TOP/TA Programming Unit

KOLVER

Kolver Italy is European Leader in programmable Screwdrivers with hi-range torque upto 50 Nm.

120 Watt Digital Soldering Station
Fast thermal recovery DSSLF120
(Two process temperatures) for automotive, LED Lighting, Solar Panels and Lead Free soldering

Hi-End Model FumePRO101-LDCF
Laser Dust particles and Chemical Fumes powerful Extraction System



0.6x1.2 meter ESD Safe Table Mat with 2 snap buttons Dual Jack ESD Grounding & ESD Safe Wrist Strap
Other customized size are available
0.9x10 & 1x10 meter Rolls available

Model MFRS500SUSB-S with Stand
Value-for-money 3-in-1 SMD & Thru-Hole Rework System
Hot Air Pencil has in-built Vacuum Pick-up for large SMD ICs

Digital Control High reliablity
Drying Oven Model IDO4215
Room Temperature to 250°C
300 x 300 x 270 mm internally

STANNOL Germany
Lead Free Solder Wires
P/N 648111: 0.5mm/500g
P/N 648132: 0.7mm/500g
P/N 648108: 1.0mm/500g

Hi-quality real ESD Safe 4-Lever adjustable PCB Magazine Rack IPMR-805

High Quality 8092LED Portable/Light weight LED QC Magnifier 3X

Hi-End Model ITK-MAS-4215
Electronics Maintenance & Field Repair Master Toolkit

Model Colibri Smart Tweezer for LCR Chips measurement
Siborg is a reseller like Inde. Inde provides parts/service.

Humidity range : 20~60%RH
Cabinet Model IDSC-2060-240
598x370x1083 mm internally for dehumidifying expensive SMD ICs and Circuit Boards

Please visit website http://indeonline.in/ for all products and to download data sheets

INDE
reliable & caring since 1976

Headoffice: Inde Enterprises, 745 Sector 8-B, Chandigarh 160009
Email: headoffice@indeonline.in • Cell Phone: 09316134502
Branches & Associates: Bangalore • Delhi • Hyderabad • Indore • Mumbai • Nashik • Pune • Vadodara

BEST QUALITY 40 years of RELIABLE SERVICE

Come Forth Into **the Light of Things**

Dilin Anand is a senior assistant editor at EFY. He is B.Tech from University of Calicut, currently pursuing MBA from Christ University, Bengaluru

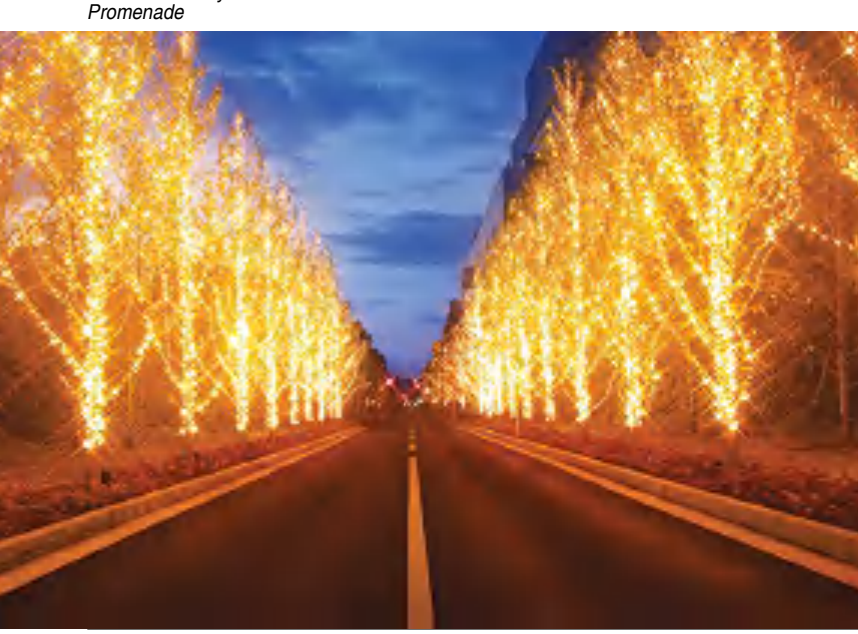
"Come forth into the light of things, let nature be your teacher," wrote William Wordsworth in his poem from 1798 titled The Tables Turned. Any conspiracy theorist worth his salt would have loved to jump on that line as a prediction of what is to come.

Today we see the Internet of Things weaving its magic to revolutionise lighting. The latest bulbs let you adjust the intensity and colour to mimic natural light. These can transform from a bright white-yellow like the morning Sun to a warmer and more golden-red part of the spectrum in the afternoon. Or these can allow you to simulate an entire golden forest, which is what Japanese electronics component manufacturer ROHM did just last year. What is enabling all this?

What happened to hardware

"A lot of changes have occurred since last year, such as the change from emitter technology to chip on board technology, different soldering processes for different chip manufacturers, driver requirements for various wattages and much more. This is a continuous process and a manufacturer needs to adapt according to this dynamic change," say Siva Satheesh, managing director, and Abdul Basith, executive director, Euro Lights, India.

ROHM Luminary Promenade



Belkin WeMo devices run on Qualcomm's Atheros AR9331 system on chip (SoC). Disney Research published a white paper where they discuss an innovative LED-to-LED communication system that uses the same SoC along with an 8-bit ATmega328p running Visible Light Communication (VLC) firmware and connected to an amplification board. It uses visible light to send data at a rate of up to 1kbps. The do-it-yourself bulbs are designed to interact with other gadgets that may not have full Wi-Fi connectivity and instead read data using VLC that uses visible light between 400THz and 800THz.

NXP's GreenChip iSSL and GreenChip iCFL bring together wireless connectivity, energy-efficient lighting and low-power standby in a solution that supports software stacks like Zigbee and JenNet. JenNet-IP is a 6LoWPAN mesh-under-tree network with low memory footprint, specifically targeting low-power IEEE 802.15.4 based networking for residential and industrial applications. ZigBee LightLink is a standards based solution targeting in-room lighting for residential applications.

LEDSENSE is a new low-voltage driver architecture created by a company named Terralux. The company claims that they program LM-80 curve (an industry standard that lets users evaluate LEDs) into each product and monitor the temperature to ensure the LED is not overdriven for ambient temperature, and also ensure that their products comply with NEMA SSL6/7 dimming standards.

Back in India, OMTRONICS Twilight Switch is a sunlight based automatic on/off sensor that switches on at dusk and switches off at dawn."Improved dimming is possible by Android devices, infrared sensors and Bluetooth controllers these days. You also see motion sensors based

light on/off control," says I. Hari Prasad from Omtronics.

FLYON is a lighting device being developed by Quantum Dots, which glows while floating in air without any wired connection. "It works on the amalgamation of maglev and Witiricity. FLYON involves lifting forces, electromagnetic suspension, position sensing, magnetic flux, flux orientation and frequency of operation including Witiricity. Witricity power sources and capture devices are specially designed magnetic resonators that efficiently transfer power over short distances via the magnetic near-field," explains T.A. Babu, managing director, Quantum Dots Technology Pvt Ltd, Quantum Dots.

Plessey announced its range of MaGIC LED die manufactured on the company's patented GaN-on-Silicon technology. The blue die is referred to in the company's press release as a blue pump for its ability to pump phosphor to a white colour range.

Overall, there seems to be a focus on improving the communications aspect of lighting as well as enabling greater precision with which these can be controlled.

What happened to the controls

A virtual home for every light bulb—that is what the future of smart lighting promises us (and delivering, too!). By having an Internet address for every bulb to call home, we gain the ability to call it up and control it as we please from anywhere across the globe through the Internet.

One innovative way to control lights is when wearable devices get in on the control game, too. Misfit is coming up with Misfit Home Service that will let Misfit fitness trackers tell the lights when to brighten up. One use case is where the tracker detects the level of sleep of the user and uses lights to simulate a sunrise inside the bedroom.

"Touch the Lights!" Last year, over Christmas, ROHM held Touch the Lights, a participatory-style event. At the event, every time a person ran a fingertip along an installed touch display, trees and cakes on the big screen would be decorated along with it

Sensor based lighting systems are now being made smarter to fit in with human behaviour and responses. For instance, motion sensor systems that switch lights based on people entering the room can now differentiate between a pet and a person. These also do not switch off immediately when a person leaves, instead keep the light on for a few minutes as people tend to feel creepy when lights behind them shut off as they walk through a hall.

Lutron and Insteon have had their lighting kits designed to work flawlessly with Apple's HomeKit devices. This means users can control lighting by speaking to their phone or watch.

Cisco Smart + Connected City Lighting solution combines with their City Multi Sensor Node to create a light-sensory network. These standards based systems gather a wide variety of data from the environment, including levels of humidity, CO_2 and O_2, UVA and UVB light, particulate matter, motion and seismic activity, video, sound and more.

There is one thing to be wary of, however. "The problem with some app based systems is that, whenever you are activating lights through a mobile phone, you are going through servers from different countries. So full dependency is on the server located in that country. This leads to a situation where external firms retain control over home automation systems. Even big firms have systems supported by servers in certain risky countries," explains Joy Biswas, product manager, Forbix Semicon.

How is Forbix solving the problem? They had designed a system in 2007 that was supposed to be inde-

Lighting as a service

A company named Enlighted is offering a Global Energy Optimisation programme that sees it offering lighting solutions as a service to companies. Enlighted will take care of the upgrade costs and capital expenditure involved initially and will later collect a set rate from its customers depending on the saved electricity. The company guarantees savings of 10 to 20 per cent on the energy bill.

MAJOR CONTRIBUTORS TO THIS REPORT

Abdul Basith, executive director, Euro Lights, India

G. Jeganathan, director, GTP Equipments India Pvt Ltd

I. Hari Prasad, Omtronics

Joy Biswas, product manager, Forbix Semicon

Siva Satheesh, managing director, Euro Lights, India

T.A. Babu, managing director, Quantum Dots Technology Pvt Ltd

pendent of these servers. They are now working on a better system that works on webmail servers, where triggers are sent through webmail, thus allowing for redundancy in the case of disrupted communication.

Plugging in some smarts

Not in the mood to build your own smart lighting system? There are some amazing products available that can let you plug in a smart lighting system into your home without having to get your hands dirty with code.

Philips Hue has stepped things up a notch. You can now use your iOS phone to not just switch on and off bulbs, but also pick colour, brightness and program timing, too. It also lets you use If This Then That service to get your lighting system to respond to situations like flashing red for a call from, say, your in-laws.

Elgato's Avea is another Bluetooth Smart bulb rated at 7W and 430lm. Belkin has a similar functioning solution in its WeMo branded LED bulbs. LIFX is a similar product but works on Wi-Fi instead of Bluetooth Low Energy. Belkin has also brought out a WeMo light switch that lets you control dumb bulbs with your phone.

If you really want to take things ahead with your existing lighting and home electronics, then LightwaveRF has a solution to swap your home's sockets with their Internet-enabled switches. GE Link is another option that lets you remotely control and sync to a connected device through an app called Wink.

Those on a budget can look at Cree Connected LEDs, as these are one of the most inexpensive bets available. For a more all-inclusive integration, Lutron has a product named HomeWorks QS that can control not just light but interior and exterior systems, audio-visual and heating, ventilation and air-conditioning, making it more of a home environment control system. In line with this concept, it also lets you create scenes, which are preset light and shade levels. For example, press Entertain button on the keypad in your living room, and lights and shades will adjust throughout your home to create the pre-planned ambience.

What will happen to the switch

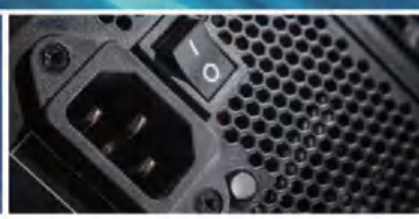
The US Navy's design principle, "Keep it simple, stupid," is now repeated by many designers. What can be simpler than a light switch? No switch!

Smart lighting is built on the premise that not only can you control your lights from anywhere, you can also set these up such that these do the controlling on their own. That means no more fumbling for the light switch when you get back home at night, or when you make your way to the kitchen in the middle of the night.

"There is a possibility that a new product that is highly innovative might not necessarily be cost-effective, user-friendly or eco-friendly. But when a new product or component meets these three criteria and satisfies customer requirements successfully with high satisfaction, then change is inevitable," explains G. Jeganathan, director, GTP Equipments India Pvt Ltd. ●

Multiple Independent Power Channels

High Integration of Intelligent Analog and Digital Features



Offering a level of capability that is not traditionally found on low-cost 8-bit PIC® MCUs, the PIC16F176X family offers up to two independent closed-loop channels. The family enables the ability to interconnect the on-chip peripherals to create custom functions specific to each application. The combination of these peripherals creates an LED dimming engine that synchronizes switching control and faster turn off, thus eliminating LED current overshoot and decay.

- Multiple independent power channels
- LED dimming engine
- Interconnect on-chip peripherals to create custom functions
- Available in a small form factor

India Sales Offices:
Bangalore (080) 3090-4444 • **New Delhi** (011) 4160-8631 • **Pune** (020) 3019-1500
Email: asia.inquiry@microchip.com

www.microchip.com/PIC16F176X

MICROCHIP

FPGA Prototyping Techniques

V.P. Sampath
is an active member of IEEE and Institution of Engineers India. He is a regular contributor to national newspapers, IEEE-MAS section and has published international papers on VLSI and networks

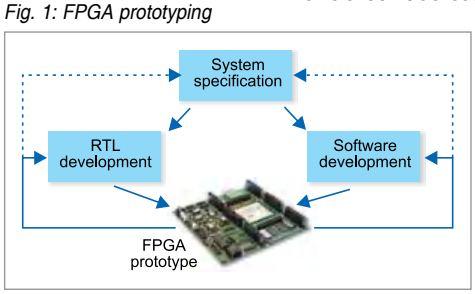
Field programmable gate array (FPGA) prototyping, commonly referred to as FPGA based prototyping, application-specific integrated circuit (ASIC) prototyping or system on chip (SoC) prototyping, is the method to prototype SoC and ASIC designs on FPGAs for hardware verification and early software development.

FPGA is a much faster engine for running the register transfer level (RTL) model. Running an SoC design on an FPGA prototype is a reliable way to ensure that it is functionally correct. About a third of all current SoC designs are fault-free during their first silicon pass, with nearly half of all re-spins caused by functional logic errors. FPGA based prototyping allows speed ranges into tens of MHz and often offers the best cost-per-gate per MHz for software development and hardware regressions in the project phase when RTL becomes stable enough, so that fast turnaround time and hardware debug matter less.

A single prototyping platform can provide verification for hardware, firmware and application software design functionality before the first silicon pastime-to-market (TTM) period is shrinking. It is typically limited in capacity and can take months to bring up due to modifications required in the design and subsequent verification. The benefit, once brought up, is a speed range in tens of MHz range that is sufficient for software development.

In today's technological-driven society, new products are introduced rapidly, and failing to have a product ready at a given market window can cost a company a considerable amount of revenue. If a product is released too late, the product could be rendered useless, costing the company its investment capital for the product.

Fig. 1: FPGA prototyping



After the design process, FPGAs are ready for production, while standard-cell ASICs take more than six months to reach production. Today, state-of-the-art ASIC prototyping and software development tools join software development platforms running reference designs with pre-packaged IP configurations. Prototyping kits are operational out-of-the-box, and allow hardware and software developers to immediately engage in integration and validation tasks necessary to ship the next great SoC design.

With the increasing cost of mask sets and continuous decrease of IC size, minimising the number of re-spins is vital to the development process. Single FPGA devices can hold up to 20 million ASIC gates, with utilisation rates of 60 per cent and FPGA systems promise to hold almost 100 MGs. Earlier, the most common hardware configuration on the FPGA prototyping board consisted between four to nine clocks, with the fastest clock running more than 200MHz.

Key advantages and issues

Prototyping is important because of high performance and accuracy, real-time dataflow and extended RTL testing and debugging. FPGA based prototypes offer unbeatable flexibility, capacity and speed. The key advantage of FPGA based systems is speed and the main volume of FPGA based prototypes today is to enable software development and sub-system validation. Many benefits come from the co-design of prototype hardware, firmware and software elements that help expedite migration from raw ASIC RTL and IP.

From a chip perspective, at about 60 per cent into a project, three main issues have to be resolved. First, error rate in the hardware has to be low enough that design teams find confidence to commit to a tape out.

Second, the chip has to be validated enough within its environment so that it works within the system.

The last is that, significant portions of the software have to be brought up to be confident that software/hardware interactions work correctly.

Abstraction levels

Prototyping today happens at two abstraction levels, namely, using transaction-level

models (TLMs) and register transfer level (RTL) models, using five basic engines.

1. Virtual prototyping based on TLM models
2. RTL simulation
3. Emulation
4. FPGA based prototyping
5. Bringing up

FPGA basic engines

FPGA based emulators are typically weaker with respect to debug efficiency and turnaround time, making these less reactive and similar to FPGA based prototypes. The downside to standard FPGA based prototyping is capacity limitations as well as longer bring-up due to the changes that have to be made to map the RTL to the FPGAs. So only the efficient combination of the four engines, namely, emulation, virtual prototyping, RTL simulation and FPGA based prototyping, provides a complete solution.

Emulation. Emulation extends verification to the full chip and at the chip-in-system level by enabling connections to real system environments like PCI, USB and Ethernet. The main advantage of processor based emulation is fast turnaround time for bring-up, which makes it ideal for the project phase in which RTL is not quite mature yet.

In addition, it allows multi-user access and excellent hardware debug insight in the context of real software that can be executed at MHz speeds, resulting in very efficient hardware/software debug cycles. Standard software debuggers can be attached using JTAG adaptors or virtual connections.

Virtual prototyping. Virtual prototyping can enable software development as early as a fortnight after the specification is available. It does not allow detailed hardware debug, which is the initial strength of RTL simulation. Used initially for RTL development, IP integration and design verification, RTL simulation can extend to the complexity of sub-systems and is a sign-off criterion for gate-level simulation and timing sign-off. It allows the fastest turnaround time for new RTLs, offers excellent hardware debug but is typically too slow to execute substantial amounts of software. To better extend to sub-systems and the full SoC, verification acceleration moves the device under test into hardware and can allow enough speed up for bare-metal software development.

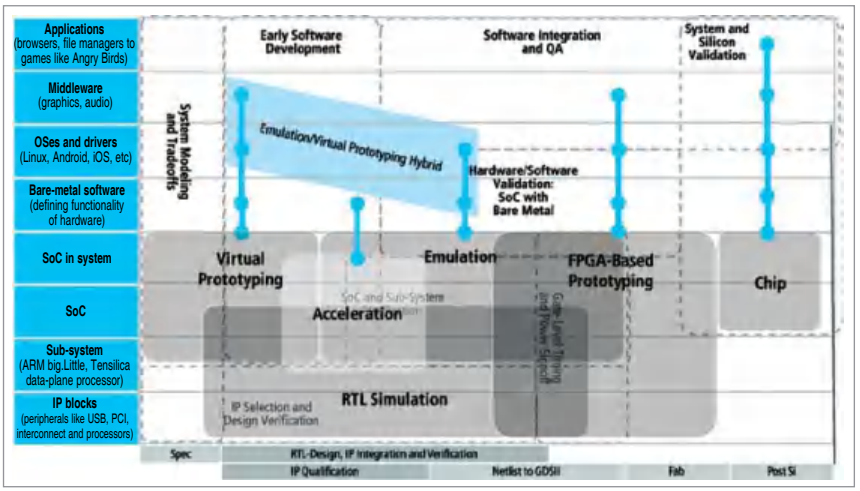


Fig. 2: Four basic engine sweet spots and scopes

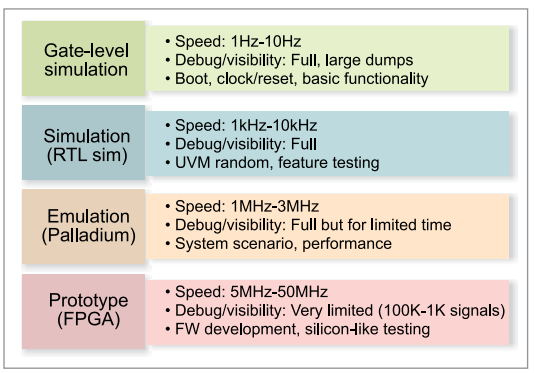


Fig. 3: An example of how multiple platforms are used in conjunction

The different engine sweet spots as an overlay on the main user tasks are shown in Fig. 3.

Techniques

Emulation and RTL simulation are combined to achieve simulation acceleration. Emulation and TLMs with fast models from ARM are combined to accelerate operating system (OS) bring-up and software-driven testing. Emulation and FPGA based prototyping are combined to combine the speed of bring-up for new portions of the design in emulation with the speed of execution for stable portions of the design in FPGA based prototyping.

Hardware assisted verification

Starting at RTL level, the ultimate goal is to make the model execute faster than it could in a software simulator. Another issue is that, software simulation slows down significantly when it exceeds the physical memory of the computer, so there is a capacity issue that plays here as well.

There are two general ways to solve the problem, referred to as direct and indirect implementations.

In the case of direct implementation, while compiling a model into an FPGA, an actual implementation of that model in hardware is created. It may not be the same as the one used in an SoC but it is an implementation nonetheless. Mapping emulates the function of the intended hardware. This technique is generally referred to as emulators, because these are directly executing an implementation of the model.

In indirect implementation, mechanisms are devised that allow effects of concurrency to be evaluated even though the simulator is actually incapable of doing more than one thing at a time.

Simulation accelerators contain a large number of simple processors, each of which simulate a small portion of the design and then pass results between themselves. Each of these processors runs slower than the processor on desktop, but the accelerator may possess millions of these smaller processors and the net result is a significantly higher execution performance. These can deal with parallelism directly as all the processors are running in parallel. An example of this type of hardware-assisted solution is Palladium product line from Cadence.

The custom chip could also contain debug circuitry, visibility mechanisms and a host of other capabilities. Each chip is capable of emulating a small piece of design, and larger designs are handled by interconnecting many chips together, again with sophisticated interconnect capabilities. An example of this type of emulator is Veloce from Mentor Graphics.

Another way to implement an emulator is by using off-the-shelf components such as FPGAs. Here, you not only map the design into the FPGA but also implement visibility, debug and other such capabilities into the FPGA. As with the custom chip, multiple FPGAs can be put together to handle arbitrary design sizes. An example of this type of emulator is ZeBu from EVE.

In in-circuit emulation, an emulator or accelerator is connected into a real-world application. Most emulators can only muster a few MHz of clock speed, especially when full visibility is made available. So it is necessary to insert a speed bridge that can handle the difference in execution rates on each side of the bridge. This involves data buffering or manipulation of protocols to artificially slow down the real world to the rate that the emulator can handle.

The next major way these are used is standalone, wherein the entire model fits into the emulator or accelerator, along with a set of stimuli to exercise the model. These can run as fast as the emulator, stopping only when additional stimulus is required or when captured data has to be flushed out of the device.

If the design contains a processor, it is also likely that a version of the processor exists for the emulator. Emulator vendors provide special boards that make many popular processors available. But if parts of the design or testbench cannot be mapped into the emulator, it has to be coupled with a software execution environment. This is called co-simulation, as it inherently involves two simulation engines cooperating to solve the problem. The emulator can now only run as fast as the simulator, or actually even slower because the communication makes it even slower.

A more modern alternative is what is called co-emulation. The primary difference between the two is that communication is raised to the transaction level rather than being at the implementation level. ●

life.augmented

MAKE EMBEDDED DEVELOPMENT AS EASY AS 1,2,3 BY STM32ODE

STM32 Open Development Environment

STM32Cube software

A set of free tools and embedded software bricks to enable fast and easy dvelopment on the STM32, including a Hardware Abstraction Layer and middleware bricks.

STM32Cube expansion software

Expansion software provided free for use with the STM32 Nucleo expansion board and fully compatible with the STM32Cube software framework. It provides abstracted access to expansion board functionality through high-level APIs and sample applications.

STM32 Nucleo development boards

A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.

STM32 Nucleo expansion boards (X-NUCLEO)

Boards with additional functionality that can be plugged directly on top of the STM32 Nucleo development board or stacked on another expansion board.

STMicroelectronics Pvt Ltd
Plot No 1, Knowledge Park III,
Greater Noida 201308, Uttar Pradesh, India

Authorized distributors

• **Arrow: Murali:** +91-96866 79492 • **Asia Lucky: Rekha:** +91-98999 75331 • **Avnet: Sravanthi:** +91-99805 67572
• **EDOM: Raghunatha. G:** +91-81304 26926 • **Future: Pawan:** +91-98452 22703 • **Teck: Sumit:** +91-98997 35127
• **Tomen: Priti:** +91-98197 94974 • **WT: Ramkumar. N:** +91-90080 88998 • **Yosun:** Anurag: +91-99106 45646

Send Enquiry to: mcu-enquiry@st.com **www.st.com/stm32ode**

What's New in
Programmable Power Supplies

Biswajit Das
is manager-R&D,
EFY Labs

A programmable power supply is a remote-controlled-type power supply that has an analogue input or a digital interface. It is used in a wide variety of applications, including automated equipment testing, crystal growth monitoring, semiconductor fabrication and X-ray generators. It typically employs an integral microcomputer to control and monitor power supply operations. A power supply equipped with a computer interface may use proprietary communication protocols or standard protocols and device control languages such as Standard Commands for Programmable Instruments (SCPI).

Programmable DC power supplies

Power supply manufacturers have to get their devices certified by nationally-recognised primary standards laboratory such as National Institute of Standards and Technology, or simply NIST, or by an internationally-recognised agency such as CSA, UL or VDE.

There are two basic types of programmable DC power supplies that are commonly used: linear and switch-mode.

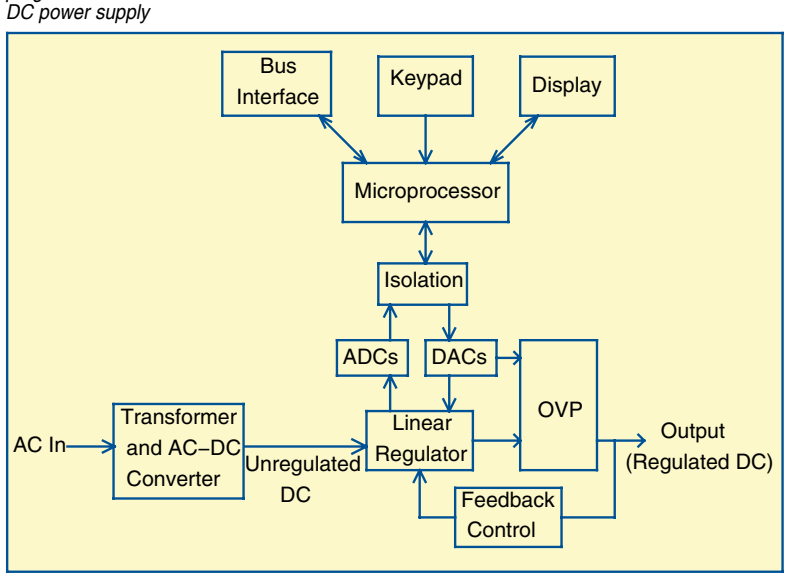


Fig. 1: Simplified block diagram of a programmable linear DC power supply

Linear power supplies operate by rectifying AC line power to create DC and then filtering and regulating it to produce user-selectable voltage or current levels. These are heavier because the 50Hz or 60Hz transformer and associated filters are physically larger.

Switch-mode power supplies start out the same way, rectifying and filtering AC line input voltage; however these chop the DC into AC. These are significantly smaller, lighter and more efficient than linear ones, and have replaced linear supplies in many applications.

Linear power supplies continue to be a popular choice for test equipment. These are generally durable, accurate and deliver power with little noise. Their simple, direct feedback mechanisms deliver excellent load regulation and overall stability. Fig. 1 shows a simplified block diagram of a programmable linear power supply.

Microprocessors receive input from the user interface or the remote interface. A digital-to-analogue converter (DAC) takes the digital setting and translates it into an analogue value, which is used as reference for the analogue regulator. Setting resolution and accuracy are determined by the quality of this conversion and regulation process. Some common parameters to select a programmable DC power supply are given below:

Resolution and accuracy. Programmable voltage and current settings have resolution and accuracy specifications associated with these. Resolution determines the minimum increment in which the output may be adjusted, and accuracy describes the extent to which the value of the output matches international standards. A DAC with more bits will have more resolution of its output and be able to deliver more distinct values for the control loop to use as reference. Accuracy in

MORE FIREPOWER IN THE TOOLBOX

THE TG165 SHOWS WHAT'S HOT FOR INSTANT TROUBLESHOOTING.

The FLIR TG165 Spot Thermal Camera bridges the gap between single spot infrared thermometers and FLIR's legendary thermal cameras.

Check out the interactive simulator to experience this groundbreaking tool in action. **www.flir.com.hk/TG165**

FLIR Systems India Pvt. Ltd.
1111, D Mall, Netaji Subhash Place, Pitampura, New Delhi – 110034
Tel: +91-11-4560 3555 Fax: +91-11-4721 2006 E mail: flirindia@flir.com.hk
Website: www.flir.com

Images used for illustrative purposes only.

₹45,600/-*
(*Inclusive of All Taxes)

FLIR | The World's Sixth Sense™

EXTECH INSTRUMENTS
A FLIR COMPANY

True RMS Multimeter @ Unbelievable Price

EX205T

₹ 3500/-*
* Local Sales Taxes Extra

Key Features

- Auto-ranging
- True RMS for accurate AC readings even with non-sine wave signals
- Measure current, voltage, resistance
- Max Hold to capture maximum readings
- Low current resolution down to 0.1µA
- Easy to read, 4-digit backlit display (2000 count)

TOUGH TOOLS FOR TOUGH BUDGETS

MultiMeters | Clamp Meters | Thermometers | Airflow Meters | Light Meters | Sound Meters
Water Quality Testers | Tachometers | Humidity & Moisture Meters | Video Inspection Cameras

For more information, please contact us at:
FLIR Systems India Pvt. Ltd.
1111, D Mall, Netaji Subhash Place, Pitampura, New Delhi – 110034
Tel: +91-11-4560 3555 Fax: +91-11-4721 2006 E mail: flirindia@flir.com.hk Website: www.extech.com

Programmable DC Power Supplies

Model	Description
Keithley-Instruments 2230-30-1 	• Number of channels: 3 • Channel 1 and 2: (0-30)V/1.5A, Channel 3: (0-6)V/5A • Line regulation: Voltage (< 0.01% + 3mV), Current (<0.1% + 3mA) • Ripple and noise: Voltage (7MHz) < 1mV rms, Current (20MHz) <5mA rms • USB, GPIB interface • Display type : VFD
B&K Precision 1697 US$ 355 	• Number of outputs: 1 • Output voltage: (1-40)V, Output current: 5A • Line regulation: 50mV • Ripple and noise: 25mV, <10mA rms • RS232 interface • Display type: LCD
Extech 382280 US$ 649 	• Number of outputs: 3 • Channel 1: (0-40)V/5A, Channel 2: 5V/2A, Channel 3: 3.3V/3A • Ripple and noise: 3mV, 3mA • Accuracy: 0.05% ±9mV, 0.02%±9mA • Display type: LCD
Aplab PPD3003-S 	• Number of outputs: 3 • Channel 1 and 2: (0-30)V/3A, Channel 3: (0-5)V/3A • Line regulation: Voltage(< 0.01% + 3mV), Current (< 0.1% + 3mA) • Ripple and noise: Voltage < 1mV rms, Current < 5mA rms • GPIB interface • Display type: VFD

Programmable AC Power Supply

Model	Description
B&K Precision 9801 US$ 1995 	• Number of outputs: 1 • Output voltage: (0-300)V AC, Output current: 3A • Crest factor: ≥4 • Line regulation:0.1% maximum for a ±10% line change • Load regulation: ≤0.5% FS (resistive load) • Response time: <100μs • Display type: VFD

**Prices of the instruments are as listed on Mouser website*

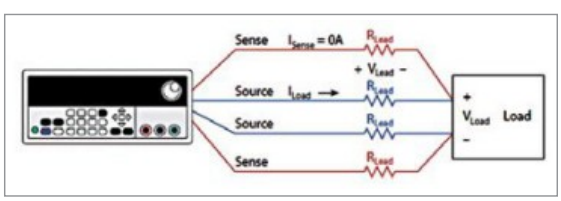


Fig. 2: Remote-sense capability

a power supply is largely due to error terms in the DAC, including quantisation error.

Read-back accuracy is sometimes called meter accuracy. It determines how close the internally-measured values are to the theoretical values of the output voltage (after setting accuracy is applied).

Read-back resolution is the smallest change in internally-measured output voltage or current that the instrument can discern. It is usually expressed as an absolute value, but may also be given as a percentage of full scale.

Load regulation. It is the measure of the ability of the output voltage or output current to remain constant during changes in the load.

Line regulation. It is a measure of the ability of the power supply to maintain its output voltage or output current while its AC line input voltage and frequency vary over the full allowable range.

Remote sensing. A programmable power supply is equipped with remote-sensing capability. Remote sensing is required in applications where load is located at some distance, typically more than 3m (10-feet), from the power supply output terminals. You can also use remote sensing if the measured voltage at the load input power terminals is significantly lower than the voltage measured at the power supply output terminals.

Difference in voltage is based on the amount of current and the load lead size and length. It uses a four-wire connection (Fig. 2) so that the voltage you set on the supply is the voltage you get at the device under test (DUT) in spite of voltage drops in cables that carry current between the power supply and DUT.

Analogue interface. DC programmable power supplies typically provide a standard and isolated analogue interface, through which a supply's DC output voltage, current and overvoltage protection can be set. These values are controlled by supplying a voltage signal, a current signal or by connecting a resistor to the analogue input. For example, you can use the analogue output of a PLC to control the output voltage of a power supply.

Residual AC. Output of these DC power supplies is not perfect DC. Some AC is to be expected on the output. For some applications excessive AC on the output can produce unexpected circuit behavior, so it helps to know the amplitude of the residual AC.

Spurious AC components on the output of a DC supply are called ripple and noise, or periodic and random deviation. These terms are often used interchangeably.

Transient response. Transient response specifications indicate how quickly the output settles to a stable DC value after a change in load or settings. Most power supplies have a significant capacitance in parallel

with their outputs to help deliver clean, steady DC. When this capacitance is placed in parallel with load resistance, a time constant results that varies with load impedance. Voltage transient response of programmable power supplies is given for three conditions: increasing load, increasing setting and decreasing setting.

Variable output impedance. These supplies incorporate a variable output resistance feature, which enables test engineers to test the DUT under actual operating conditions. The variable output impedance allows them to simulate the internal impedance of a battery.

Digital interface. In general, output voltage and current of a programmable supply is set most accurately, with the highest resolution, through its digital interface. DC supplies typically offer many different interfaces, including RS232, RS485, USB, GPIB, Modbus-TCP, Modbus-RTU and Ethernet.

In addition to hardware, most DC power supply companies also supply the software you need to easily integrate your DC supply into your system. For example, AMETEK supplies IVI drivers with each supply, and the supplies are programmed using standard SCPI commands. This makes system programming and system integration much simpler.

Programmable AC power supplies

Programmable AC sources used in test applications must not only supply a stable source of AC but also simulate power-line disturbances and other non-ideal situations.

Today's switching AC power sources offer great specifications and powerful waveform-generation capabilities that allow users to generate complex harmonic waveforms, transient waveforms and arbitrary waveforms more easily than ever before. Some can even provide both AC and DC outputs simultaneously and make measurements as well as provide power. This level of flexibility is making it easier to ensure that electronic products will work under adverse conditions.

Some common parameters to select a programmable DC power supply are given below:

Current requirements. To select an AC source you must consider the current your unit under test will draw. Be sure to include inrush and transient currents that may occur during intentional input voltage swings and during different modes of operation.

Worst-case input current. Rectifier-type power supplies and motors have inrush currents anywhere from two to ten times the nominal run current. AC power sources are designed to protect themselves from excessive loads current by either folding back voltage (current limiting) or shutting down output (current-limiting shutdown), and in many cases this is user-selectable.

Crest factor. Crest factor is the ratio of peak current amplitude to rms amplitude of AC. It is important to select an AC source with low impedance and high peak instantaneous current capability. Many AC sources can only support a crest factor of 1.414. With a crest factor rating of up to 3.25:1; AMETEK CSW series AC source, for example, can drive difficult non-linear loads with ease. This translates into driving a rectifier, for instance, that has a 52A peak current at 13A rms at a 120/208 three-phase output.

Power factor. Power factor of an AC electrical power system is defined as the ratio of the real power flowing to the load to the apparent power in the circuit. A load with a low power factor draws more current than a load with a high power factor for the same amount of useful power transferred.

Regulation and distortion. Load and line regulation should be tight and distortion low. Typically, quality AC sources will have a voltage accuracy of ±0.1 per cent and a maximum total harmonic distortion of no more than 0.25 per cent. ●

INVEST. IN. INDIA.

INDIA ELECTRONICS WEEK

January 11th-13th, 2016 • Bengaluru

Six Events. Coming Together

Electronics ForYou expo
Innovate. Design. Manufacture. Source.

An expo for OEMs to meet electronics related suppliers and service providers

electronics Rocks

India's largest confluence of technology decision makers across the electronics industry

TEST & Measurement India

Asia's leading exposition of test & measurement products and services

LEDASIA.in

India's first event to focus on the latest technologies for LED lighting

iotshow.in

India's first large scale IoT event with an exposition and conferences

raksha India

India's first event related to the use of electronics in defence, aerospace & security

What's Happening at **IEW 2016**

- Buyer Seller Meet
- ELCINA CEO Summit
- Vendor Development Talks
- International Exhibitors
- T&M showcase
- Innovators' Zone
- ELCOMA's LED Lighting Summit
- LED technical conference
- VCs meet IoT Startups
- Technical conference for Developers and Systems Integrators
- Technical conference for Design Engineers
- Success Stories of IoT implementations

Technical Conference for electronics design engineers and embedded systems' developers

January 11th-13th, 2016 • Bengaluru

For more information, talk to us at +91-11-40596605 or email at growmybiz@efy.in

Gold Partner

Associate Partners

Tea/Coffee Partner

Supporting Association Partners

International Partners

Community Partners

Media Partners

Online

Print

What is Happening to **Thermography Tools**

Dilin Anand is a senior assistant editor at EFY. He is B.Tech from University of Calicut, currently pursuing MBA from Christ University, Bengaluru

Abhimanyu Rathore is a content specialist at EFY

What is a quick and effective way to identify defects on a circuit board assembly without conventional troubleshooting? The answer is thermography. Thermal infrared (IR) imaging devices are excellent tools for increasing the life expectancy of devices by getting real-time imagery of temperature distribution as well as development of heat on objects in a board through a contact-less tool.

Nip it in the bud

Higher-resolution thermal imaging cameras can spot overheating in individual components like transistors and resistors across the whole printed circuit board (PCB). This means that engineers can use it in an early-stage design to sort out circuitry damages. For example, a component that is not designed to go above 85°C could end up above 110°C and get stressed by overheating. The thermal camera immediately catches the over-heated component in its viewfinder without the engineer having to probe each component individually. This means that chances for an over-cooked component to ruin a PCB are far lesser since the engineer can see almost the entire board at a glance.

Earlier this year, Keysight had announced higher-temperature models, targeting electrical and electronic applications where these can be used to detect variations over a wider temperature range. U5856A and U5857A can perform temperature measurements up to 650°C and 1200°C, respectively.

Fluke TiX1000

Fluke and FLIR also launched similarly-named models: Fluke's TiX1000 and FLIR's T1K or T1020. Both these models have very good specifications; details of these have been included in the table.

Upgrades for displays and sensors

Fluke's new expert series thermal imagers called TiX560 and TiX520 come with an articulating lens that can rotate 180° as well as a large touchscreen LCD featuring a resolution of 320 × 240. The camera also

What goes inside newer thermal imagers

FLIR's T1K series of thermal imagers come with a full-high-definition (FHD) sensor paired with HDIR lenses.

Fluke's TiX series of thermal imagers feature 100 per cent diamond-turned-germanium lenses covered with a special coating that is designed to transmit energy to the detector with very good efficiency.

FLIR also released Muon core for thermal imaging, which simplifies the integration of thermal imaging capabilities for original equipment manufacturers. You might find it inside upcoming thermal imagers from other firms, too.

Thermal image overlaying CMOS images technology

Most innovative advances in thermal imagers for electronics engineers over the past few years include thermal image overlaying complementary metal-oxide semiconductor (CMOS) image technology. It offers a better thermal and image resolution for object identification to locate the bug from thermal gradient of circuitry, easily and quickly.

We are able to offer a wider industrial temperature range of thermal cameras to bridge the original industrial IR thermometer user and commercial thermal camera user with a better resolution of thermal cameras with CMOS overlaying graphic features and precise distance-to-spot ratio laser in circle indication.

—David Ko, general manager, Flex Instruments Co. Ltd

LCR Meters & Impedance Analyzers

HIOKI
EE Corporation, Japan

IM7583 Measurement frequency 1 MHz to 600 MHz

IM7585 Measurement frequency 1 MHz to 1.3 GHz

Available in 300MHz, 600MHz & 1.3GHz offerings.

Ideal for common mode filter and chip inductor production lines
Perfect for R&D and production of ferrite chip beads and chip inductors.
R&D applications • Measure frequency characteristics and level characteristics

- Five-model equivalent circuit analysis
- Measured value search function

Distributor

TANGENTTEST

TANGENT TEST TECHNOLOGIES

Bangalore Head Quarters : No. 528, 2nd Floor, 8th Main, 6th Stage, BEML Layout, ITPL Road, Bangalore - 560 066. Phone: 080-40936722 /922 Fax: 080-40936322
Hyderabad : Flat No. 302, Bliss Apartments, H.No. 1-4-6, Street No. 7, Habsiguda, Hyderabad - 500 007 Tel/fax: 040-40147045
Chennai : Plot No. 990, 'H' Block, 2nd street, 11th Main Road, Anna Nagar, Chennai-600 040 Phone: 044-4218 0909 / 26160146
Email: sales@tangenttest.com Web: www.tangenttest.com

Some Thermography Tools available in the Market

Parameters	Product	Field of view	Standard temperature range	Resolution	Sensitivity	Accuracy	Spectral response	Power Supply
FLIR	AX8 thermal imaging camera	48°×37°	–10°C to +150°C (14°F to 302°F)	80×60 pixels	Minimum 10 Lux without illuminator	±2°C (±3.6°F) or ±2% of reading (+10 to +100C@+10 to +35amb)	Spectral range: 7.5μm-13μm	12/24V DC, 2W continuously/ 3.1W absolute max.
	CM174	38.6°×50.0°	-25°C to 150°C (13°F to 302°F)	4800 pixels (60×80)	—	±5.4°F (3°C) or ±3% of rdg	8μm-14μm	—
	T1K thermal imaging camera	28°×21°	-40°C to +2000°C	—	<0.02°C (at +30°C)	±1°C (±1.8°F) or ±1% at 25°C for temperatures between 5°C to 150°C ±2°C (±3.6°F) or ±2% of reading at 25°C for temperatures up to 1200°C	7.5μm-14μm	—
Fluke	TiX1000 IT camera (Models: FLK-TiX1000 30Hz Fluke TiX1000 IR camera 30Hz (1024×768) and FLK-TiX1000 9Hz Fluke TiX1000 IR camera 9Hz (1024×768))	32.4°×24.7° (1.0/30mm)	-40°C to 2000°C (-40° to 3632°F)	1024×768 (786,432 pixels), 2048×1536 (3,145,728 pixels) (super resolution mode)	≤0.05°C (at 30°C) target temp (50 mK)	±1.5°C or ±1.5 %	7.5μm-14μm	External: 12V DC, 24V DC, Battery: standard li-ion video camera battery
Keysight	U5855A	28° (H)×21° (V)	–20°C~350°C	Detector resolution 160×120, fine resolution (in-camera) 320×240 (IR pixels)	Range 1: 0.07°C (at 30°C), Range 2: 0.1°C (at 30°C), Range 3: NA	±2°C or ± 2% (whichever is greater); at 0°C~40°C ambient temperature	8μm-14μm	Line voltage range: 50/60Hz, 100V AC-240V AC (auto/ universal voltage), 1.2A mains supply voltage fluctuations not to exceed ±10% of the nominal voltage, output voltage: 12V DC, 3A, installation category I (Isolated ELV supply source connected to mains through an AC/DC power adaptor)
	U5856A	28° (H)×21° (V)	–20°C~650°C	Detector resolution 160×120, fine resolution (in-camera) 320×240 (IR pixels)	Range 1: 0.07°C (at 30°C), Range 2: 0.5°C (at 30°C), Range 3: NA	±2°C or ±2% (whichever is greater); at 0°C~40°C ambient temperature	8μm-14μm	Line voltage range: 50/60Hz, 100V AC-240V AC (auto/ universal voltage), 1.2A mains supply voltage fluctuations not to exceed ±10% of the nominal voltage, output voltage: 12V DC, 3A, installation category I (Isolated ELV supply source connected to mains through an AC/DC power adaptor)
	U5857A	28° (H)×21° (V)	–20°C~1200°C	Detector resolution 160×120, fine resolution (in-camera) 320×240 (IR pixels)	Range 1: 0.07°C (at 30°C), Range 2: 0.1°C (at 30°C), Range 3: 0.5°C (at 250°C)	±2°C or ±2% (whichever is greater); at 0°C~40°C ambient temperature	8μm-14μm	Line voltage range: 50/60Hz, 100V AC–240V AC (auto/ universal voltage), 1.2A mains supply voltage fluctuations not to exceed ±10% of the nominal voltage, output voltage: 12V DC, 3A, installation category I (Isolated ELV supply source connected to mains through an AC/DC power adaptor)
MECO	IRT380P	—	–50°C~380°C –58°F~716°F	0.1°C/0.1°F	—	±1.5°C	6μm~14μm	9V battery
	IRT550P	—	–50°C~550°C –58°F~1022°F	0.1°C/0.1°F	—	±1.5°C	6μm~14μm	9V battery
	IRT1050P	—	–50°C~1050°C –58°F~1922°F	0.1°C/0.1°F	—	±1.5°C	6μm~14μm	9V battery
Flex	Thermal Camera TG-501	30°	-30°C to 800°C (-22°F to 1452°F)	• Optical resolution: 50:1 (calculated at 95 per cent energy) • Display resolution: 0.1°C (0.2°F)	<0.02°C at +30°C	±1.5°C or ±1.5% of reading ±2.0°C at -10°C to 0°C ±3.0°C at -30°C to -10°C	—	AA x 3 batteries

comes with on-camera analytics and features SuperResolution mode that quadruples the resolution into 640 × 480 or even 1024 × 768, which is full HD (FHD).

FLIR has come out with a thermal imager (T1K) that comes with a sensor having a 1024 × 768 HD detector and features up to 3.1 megapixels of detection with its UltraMax processing technology. It also comes with HDIR lenses that claim to deliver more accurate measurements from a greater distance. (FLIR claims twice the distance as legacy systems.) Additionally, it features video recording along with continuous auto-focus. FLIR also packs in some software tools that allow users to analyse data, change colour patterns and generate detailed reports.

Keysight U5850 series is also claimed to be among the first to come with four times in-camera fine resolution of 320 × 240 pixels from a 160 × 120 pixel detector that comes with manual-focus.

IR thermometer ILV-301 by Flex Instruments features a distance-to-spot ratio of 30:1 calculated at 95 per cent energy. It can sense a range from -30°C to 800°C.

MECO has a thermometer called IRT1050P that can sense from -50°C to 1050°C. It features a distance-to-spot ratio of 50:1, too.

Flex Instruments' thermal camera (model number TG-501) features a 128 × 128 pixel thermal image after interpolation. Its display is a 160 × 128 pixel TFT-LCD, mounted on a pistol grip with one navigator key operation.

FLIR T1020

Bird's-eye view of the trends

1. Decrease in product price due to availability of lower-resolution devices. Vendors have introduced many entry-level devices with lower feature sets that enabled them to bring down the price
2. Decrease in product cost due to sensor manufacturers moving from 15.2cm (6-inch) to 20.3cm (8-inch) production lines
3. Many new products with better protection from environmental influences like rain, fog and sunlight as well as the capability to survive a roughly 60cm drop
4. Better image-processing solutions in addition to higher resolutions
5. Laser focus system introduced in thermal imagers
6. Wi-Fi connectivity for data transfer through smartphones

How the ease of use of thermal imagers improved over the years

Many things got developed over the years as listed below:

1. Movable optics: One of the major problem a user used to face in the field was pain in the neck while continuously using the camera, especially in the case of harsh environmental conditions. For such applications, FLIR rolled out a movable/rotating optics design, which was accepted globally with high enthusiasm. This design eases the operation with almost no pressure on the neck while using the unit for looking at hotspots on electrical installations or places that are not easy to see.
2. PDF report generation in the field by camera: The same can even be transmitted over Wi-Fi using smartphones in the field. This reduces the report time to a few minutes and brings in efficiency.
3. Quality of image: As very high NETD levels of nearly 20mK are available in uncooled cameras at 30Hz frequency, the images are very crisp and clear, resulting in excellent image quality. This helps to pin-point problematic areas quickly.
4. JPEG format: Images taken in the field can also be viewed on mobiles or PCs that do not have dedicated software installed. Images can be stored in JPEG format and can be viewed even with basic picture-viewing software.
5. Complete range: The lowest-range camera starts at ₹ 45,000, empowering many officials who have tight budgets.

—T.P. Singh, country manager, India-Instruments, FLIR Systems India Pvt Ltd

Making it easier to use thermal cameras

FLIR TG165 was announced late last year, which is an easy-to-use thermal imager built for do-it-yourself users and for industrial professionals who require a compact low-cost tool for quick troubleshooting.

Last year, Fluke talked about its introduction of a laser focus system in thermal imagers where a laser beam was used to measure the distance, which aids the user to focus properly on the object.

FLIR TG165 comes with dual rotating lasers to visually mark the size and location of what is being measured, while an on-screen crosshair pinpoints the region on the thermal image.

FLIR C2 was also launched last year as a pocket-size camera designed to show hidden heat patterns due to energy leaks, bad wiring, HVAC issues and other problems. FLIR's T1K also comes with a rotating block that houses the optics so you can use it on tougher angles while holding your head in different positions when you are using the touchscreen to operate the device.

Start debugging those electronics

You can now pick up a thermal imager and start working on debugging your circuit board. It will help you find that one overheating chip in the board that is causing the embedded system to fail, or quickly identify that short in the circuit. ●

Part 2 of 2

Digital Forensics and Investigation: **Computer Forensics Tools**

Hari Om Prakash is working as a scientist/engineer (SD) at Systems Engineering Group, ADRIN, Department of Space, and is involved in developing applications in the field of network security and secure programming language design and implementation field

In the first part of this article, last month, we discussed digital forensics and investigation, the three phases of forensics investigation, legal considerations, branches of digital forensics, digital forensic and investigation teams, and applications of digital forensics. In this part, we look at the various computer forensics tools available.

Computer forensics techniques are essential to successfully prevent, detect, investigate and prosecute electronic crime. Evidence can be found on such media sources as CD-ROMs/DVD-ROMs, mobile phones, hard disks, computer memories, floppy disks, flash drives, memory cards, email servers, Web servers and others. Each category may require a separate forensics tool or hybrid tool. Forensic tools have been developed for different operating systems (OSes) such as Linux, Mac OS or Windows.

Fig. 1: Logicube forensic SF-5000 kit, the ultimate weapon against cyber crime

Let us take a look at the various tools that help in digital forensics and investigation process. Many of these tools are open source, while the others are proprietary. These tools may be evaluated based on various criterion such as completeness in functionality, time taken by the tool to perform its task, user friendliness and ease of use, cost and acceptability of the tool in the court of law.

Table I features some general computer forensics tools that the investigators may use.

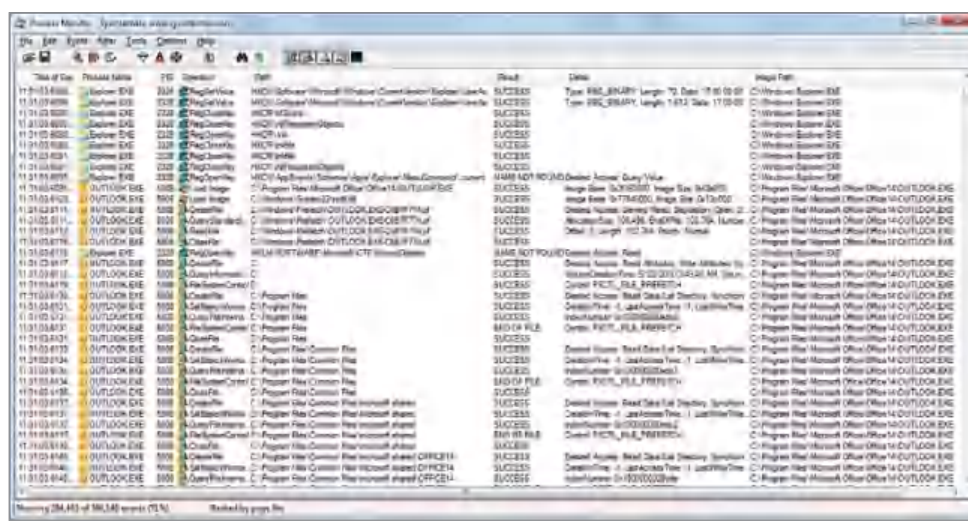


Fig. 2: Process monitor

TABLE I
General Computer Forensics Tools

Name	Platform	Description
Backtrack	Linux	Penetration testing and security audit with forensic boot capability (*www.backtrack-linux.org)*
Caine	Linux	Linux based live CD featuring a number of analysis tools *(www.caine-live.net)*
Digital Forensics Framework	Windows, Debian, Ubuntu	Analyses volumes, file systems, user and applications data, extracting meta-data, deleted and hidden items *(www.digital-forensic.org/en/download)*
Internet Evidence Finder (IEF)	Windows	Computer forensics solution *(www.magnetforensics.com)*
OSForensics	Windows	General-purpose forensic tool for emails, files, images and browsers (www.osforensics.com)
Event Log Parser	Windows	A PHP script to parse Windows event logs *(www.whitehats.ca/main/members/Malik/malik_eventlogs/malik_eventlogs.html)*
libevt	Linux, Windows	Library and tooling to access Windows Event Log (EVT) format (*www.code.google.com/p/libevt)*
P2 Shuttle Free	Windows	Remote disk mounting, network RAM capture, search tools; this is a limited version of P2 Shuttle Pro
SANS Investigative Forensics Toolkit (SIFT)	Ubuntu	Multi-purpose forensic OS
Registry Recon	Windows	Rebuilds Windows registries from anywhere on hard drives and parses these for deep analysis
EnCase	Windows	Multi-purpose forensic tool (*www.encase.com)*
FTK	Windows	Multi-purpose tool (commonly used to index acquired) media
Digital Forensics Framework	Windows, Linux, MacOS	This is both a digital investigation tool and a development platform
PTK Forensics	Linux	GUI for The Sleuth Kit (www.*ptk.dflabs.com)*
The Coroner's Toolkit	Unix-like	A suite of programs for Unix analysis
COFEE	Windows	A suite of tools for Windows developed by Microsoft, only available to law enforcement agencies
Paladin	Ubuntu	Ubuntu based live boot CD for imaging and analysis
Ubuntu guide	Ubuntu	Guide to using an Unbuntu live disk to recover partitions, carve files and the like
Volatility Framework	Unix-like, Windows	Collection of tools for extraction of artefacts from RAM
The Sleuth Kit	Unix-like, Windows	A library of tools for Unix and Windows
Categoriser 4 Pictures	Windows	Image-categorisation tool, available to law enforcement agencies
Paraben P2 Commander	Windows	General-purpose forensic tool
Open Computer Forensics Architecture	Linux	Computer forensics framework for CF-Lab environment
SafeBack	Windows	Digital media (evidence) acquisition and backup
Windows To Go	Windows	A live USB; this is a feature in Windows 8 Enterprise that allows Windows to boot and run from mass storage devices such as USB flash drives and external hard disk drives
Forensic Assistant	Windows	User activity analyser (emails, IMs, docs, browsers) plus a set of forensics tools
Nuix	Windows	Forensic-analysis and fraud-prevention software; full text search, extracts emails, credit card numbers, IP addresses and URLs; skintone analysis; support for ingesting Windows, Mac OS, Linux and mobile device data
PeerLab	Windows	FileSharing and Instant Messaging analyser
X-Way Forensics	Windows	General-purpose forensic tool based on WinHex hex editor
Bulk Extractor	Windows, Linux	Stream based forensic feature extraction of email addresses, phone numbers, URLs and other identified objects
Intella	Windows	Forensic search software; is good for searching emails
HashKeeper	Windows	Database application for storing file hash signatures *(www.forensicswiki.org/wiki/Hashkeeper)*
Evidence Eliminator	Windows	Anti-forensics software; claims to delete files securely *(www.evidence-eliminator.com)*
DECAF	Windows	Detects and Eliminates Computer Acquired Forensics (DECAF) tool that automatically executes a set of user-defined actions on detecting Microsoft's Computer Online Forensic Evidence Extractor (COFEE) tool *(www.wired.com/threatlevel/2009/12/decaf-cofee)*
NetSleuth	Windows	Open source network forensics and monitoring tool *(www.netgrab.co.uk)*

TABLE II
Memory Forensics Tools

Name	Platform	Description
CMAT	Windows	Memory-analysis tool that analyses Windows OS memory and extracts information about the OS and the running processes (www.*sourceforge.net/projects/cmat)*
Memoryze	Windows	Memory forensic software that helps incident responders find evil in live memory *(www.mandiant.com/products/free_software/memoryze)*
Responder	Windows	*(www.hbgary.com/responder-field) and (www.hbgary.com/responder-pro)*
Second Look	Linux	Easy-to-use memory acquisition and analysis capabilities for Linux system *(www.secondlookforensics.com)*
WindowsSCOPE	Windows	WindowsSCOPE is the next generation in live cyber forensics tools and memory forensics technologies *(www.windowsscope.com)*
Volafox	Mac OS	Volafox or Mac OS X Memory Analysis Toolkit is developed on Python 2.x *(www.code.google.com/p/volafox)*
Volatility	Window, Linux	A completely open collection of tools, implemented in Python under GNU general-public licence, for extraction of digital artefacts from volatile memory (RAM) samples (www.*code.google.com/p/volatility)*

TABLE III
Hex Editors

Tool name	Platform	Description
Okteta	Linux	A simple editor for raw data of files. This type of program is also called hex editor or binary editor *(www.utils.kde.org/projects/okteta)*
Hex Dump	Linux, Windows	A hexadecimal view (on screen or paper) of computer data, from RAM or from a file or storage device *(www.linux.about.com/library/cmd/blcmdl1_hexdump.htm)*
Hex Fiend	Mac OS X	A hex editor for Apple OS X (Fig. 4) *(www.ridiculousfish.com/hexfiend)*
Hex Workshop	Windows	Allows you to easily view, dissect and modify binary data (*www.bpsoft.com)*
KHexEdit	Linux	A versatile binary file editor; key features include undo/redo, overwrite/insert modes, hexadecimal, octal, binary or text only display, etc (www.*freecode.com/projects/khexedit)*
WinHex	Windows	A universal hexadecimal editor, particularly helpful in the realm of computer forensics, data recovery, low-level data processing and IT security. An advanced tool for everyday and emergency use; inspects and edits all kinds of files, recovers deleted files or lost data from hard drives with corrupt file systems or from digital camera cards (Fig. 5) *(www.winhex.com/winhex)*
xxd	Linux	A command utility that creates a hex dump of a given file or standard input; can also convert a hex dump back to its original binary form (www.*linuxcommand.org/man_pages/xxd1.html)*
HxD	Windows	HxD Hex Editor provides tools to inspect and edit files, main memory, disks/disk images and their structure using a simple and modern interface (*download.cnet.com/HxD-Hex-Editor/3000-2352_4-10891068.html)*

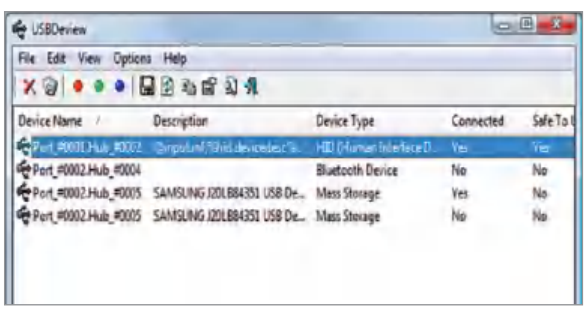


Fig. 3: USBDeview details previously attached USB devices

Fig. 4: Hex Fiend, a hex editor for Mac OS X

Computer memory forensics

Memory forensic tools are used to acquire and/or analyse a computer's volatile memory, that is, RAM. These are often used in incident response situations to preserve evidence in memory that would be lost if a system is shut down and to quickly detect stealthy malware by directly examining the OS and others running the software in memory. The various computer memory forensics tools are given in Table II.

Hex editors

Hex editors are particularly helpful in the realm of computer forensics, data recovery, low-level data processing and IT security. Such tools are used for everyday and emergency uses. These inspect and edit all kinds of files, recover deleted files or lost data from hard drives with corrupt file systems or from digital camera cards. Some tools are listed in Table III.

However, there are many other tools which we are unable to list here due to limitation of space. These include tools for:

- Hard drive firmware and diagnostics
- Disk imaging
- Linux OS based
- Mac based
- Windows based
- Open source based, besides Linux
- Enterprise
- Forensic Live CDs
- Preservation
- Telephone scanners/war diallers
- Email forensics
- Internet history forensics
- Registry forensics

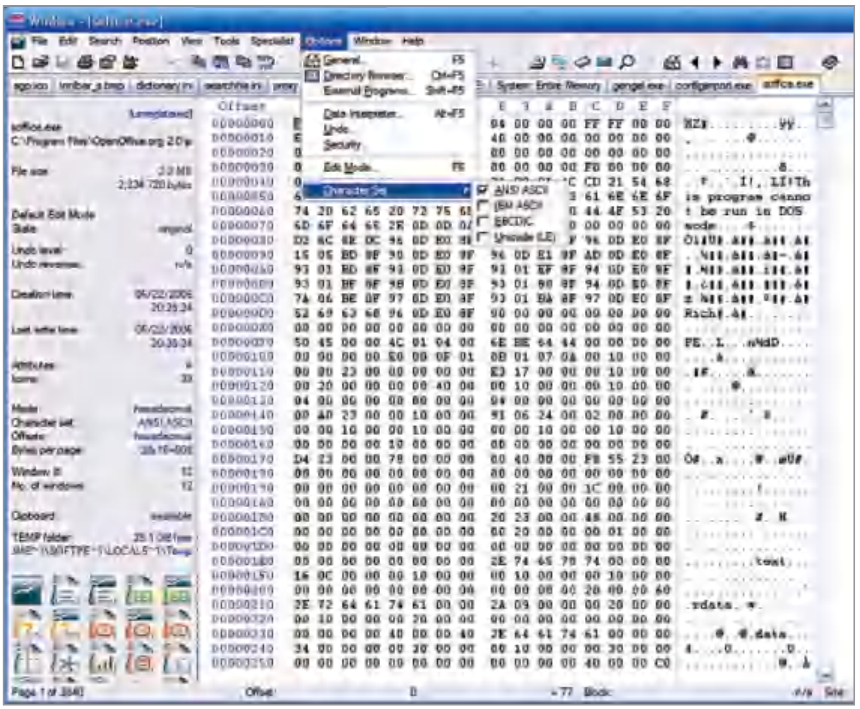


Fig. 5: WinHex hex editor

Those interested should be able to find these through the Internet, with some effort. ●

Part 4 of 5

American Carrier Strike Groups: An Electronic Perspective

B. Kamalanath is a technical writer. He is also a research scholar, pursuing Ph.D in military technology

In the previous parts of this article, we discussed air defence warfare, electronic warfare, under-sea warfare, surface warfare and strike warfare. Let us take a look at air operations in this part.

Air operations

Though air operations also fall under strike warfare, these are specialised operations of a carrier and, in turn, carrier strike group (CSG). Air operation from carriers is highly complex and highly dangerous. To support air operation, a myriad of electronic systems are installed in the carrier.

A combat aircraft is launched from the carrier through a system called catapult, which is driven by steam. Since aircraft on a carrier do not have sufficient distance to run and take off, the catapult proves very useful. An aircraft is placed on shuttle of the catapult and launched; aircraft is airborne in just two seconds. Steam pressure that has to be maintained is controlled through electronic systems much similar to industrial systems.

The catapult launches aircraft in air and then the aircraft using its full engine power ascends to an altitude. After that, it leaves for its area of responsibility. Ensuing combat actions are out of purview of this article, however the return leg is covered here.

Fig. 23: CATCC; the person sitting at the front is the approach controller

For retrieving and receiving an aircraft on the carrier, a plethora of electronic systems support the eventual landing on the carrier. But before landing, aircraft must navigate towards the carrier.

Navigation

In the sea, even gigantic carriers appear smaller than a dot for their aircraft flying at heights greater than 10km. At those heights, visually sighting the carrier becomes impossible. To retrieve the launched aircraft, the carrier must reveal its position to the incoming aircraft. The carrier does this through a system called TACtical Air Navigation (TACAN).

TACAN. Through a TACAN transponder the carrier continuously relays its identity in Morse code at a particular frequency. Through appropriate antenna arrangement, it maintains a cardioid radiation pattern for this transmission. Aircraft can receive these signals by tuning their TACAN receivers.

These receivers compare aircraft's bearing with the direction of the signal reception and give the bearing (direction) of the carrier to the pilot. The TACAN receiver also gives the slant range, known as crow-flight distance, of the carrier.

For this, aircraft's TACAN receiver interrogates the carrier's TACAN transponder with an interrogate pulse. The TACAN transponder receives that and, after a delay of 50µs, sends a reply signal. Aircraft's TACAN receiver receives this reply. Then, by knowing the time at which the receiver had sent the interrogating pulse and the time it received the reply, it calculates the round-trip distance time. This time minus the 50µs delay is the actual round-trip distance time. With the speed of the radio waves known,

range is calculated, which is the crow-flight distance.

Typically, a TACAN transponder of a carrier can provide navigational data to approximately 100 aircraft, simultaneously interrogating at a time. With TACAN, an aircraft can accurately navigate to the carrier. Direction and range are displayed in the aircraft's moving map display as waypoints and also as pointers in the pilot's head-up display (HUD). (Refer 'Fighter Aircrafts,' article published in July 2007, August 2007 and September 2007 issues.)

The next task is to control the movements of outbound and inbound aircraft. Appropriate commands and support are given to inbound aircraft for landing. This is done by carrier air-traffic control, which is generally called amphibious air-traffic control.

Air-traffic control

Since both the carrier and aircraft are moving, air-traffic control is much more complex and elaborate than their land based counterparts. All these operations are controlled from a command centre called carrier air-traffic control centre (CATCC). This command centre is situated on the top-most storey, called Pri-fly, above the flight-deck of a carrier. All aviation-related data like aircraft's flight plans and approaching aircraft's status are assembled at this centre for air operations to be monitored and controlled.

For these control operations, many radar systems play a crucial role. Outbound aircraft are allotted a 3D air corridor through which these leave without interfering with incoming aircraft. Incoming aircraft from various locations are first marshalled to another air corridor and then assigned height, direction and speed to fly in a pattern around the CSG.

Depending on the status of the aircraft—whether low on fuel or hit by enemy but in a flyable condition or having technical snag—these are assigned priorities. As incoming aircraft of high priority keep landing, aircraft flying around the CSG are instructed to move to hold pattern around the carrier. As aircraft keep landing, a landing sequence is formed where aircraft trail behind each other by kilometres.

Fig. 24: Antenna of AN/SPN-43 marshalling radar

Once aircraft are lined for landing, these are transferred to approach and landing controllers, that help the pilots in landing the aircraft. During high-intensity air operations aircraft come and land every 30 seconds. For this, a radar called marshalling radar is used, which is the air-traffic control radar.

Marshalling radar. The marshalling radar AN/SPN-43 is a 2D air-surveillance S-Band (2GHz-4GHz) radar, dedicated for air-traffic control. It is used for vectoring carrier-bound aircraft into final approach for landing. It also acts as a back-up, short-range, air-search radar for air-defence operations. It provides azimuth and range of detected aircraft from 80.5km (50 miles) to a minimum range of 229m (250 yards), at altitudes from radar horizon to 9144m (30,000 feet).

The radar has an inbuilt Identify Friend or Foe (IFF) system. The radar display console displays all echoes in the area of responsibility in the form of blips. But how can individual aircraft be set apart from these blips? For this, a system called Direct Altitude and Identity Readout (DAIR) is used to identify the aircraft.

DAIR. DAIR is a highly-automated beacon and radar-tracking system.

Fig. 25: FA-18 combat aircraft on the carrier approaching land at dusk (centreline lights are visible and a tiny green spot on the left side is FLOLS)

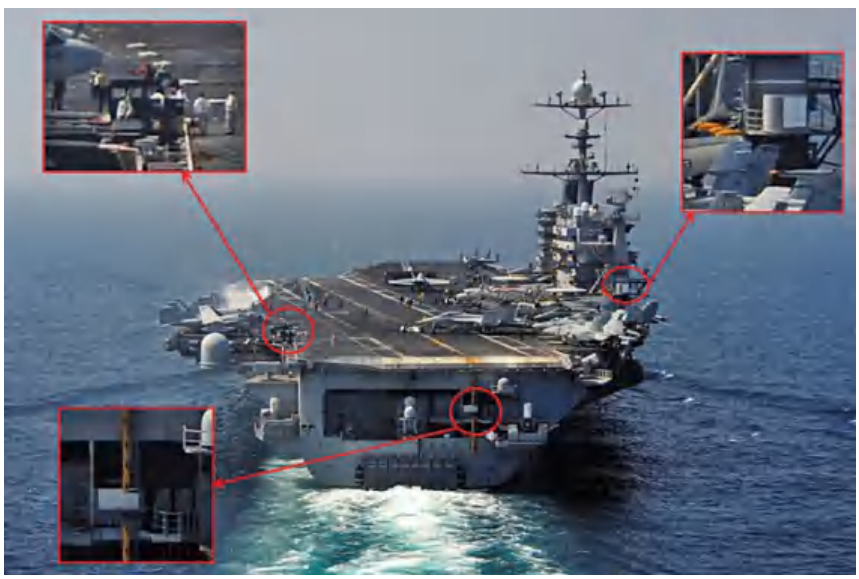


Fig. 26: AN/SPN-41 radars highlighted (the top-left highlighted section is the LSO station)

It is used for identifying incoming aircraft and operates as a sort of back-end for marshalling operations, whereas the radar operates as the front-end. Every American combat aircraft has a transponder. This transponder is queried by DAIR through AN/SPN-43 radar.

These transponders give their identity and altitude of the aircraft to DAIR through AN/SPN-43 radar. Then, DAIR superimposes this data as alphanumerals over the blips of corresponding aircraft appearing on display consoles. So mere anonymous blips are replaced by names and their altitudes. This system is also capable of processing and superimposing flight plans, geographic reference points and map lines for enhancing mission planning.

Marshalling radar-DAIR combo is a high-precision system enabling controllers to track every aircraft effectively. Through their consoles, air-traffic controllers can interact with DAIR for tracking a particular aircraft's flight. Then they give instructions for the pilot through separate communication channels that exist between air-traffic controllers and pilots. They line up aircraft in a queue for landing and then transfer the control to the landing controllers.

In CATCC, there are many personnel, each handling a specific controlling and monitoring task dealing with outbound aircraft, incoming aircraft, landing aircraft, civilian and neutral flights, unidentified blips and the like.

Landing: the mortal challenge

For any pilot, landing his aircraft smoothly is a challenge. But normal pilots come nowhere near their naval counterparts. Naval pilots have to land their aircraft on a moving aircraft carrier, which is the supreme challenge comprising layers of challenges for a pilot's airmanship because of the landing procedure. So naval pilots are considered a special breed among pilots.

Normally, an aircraft after landing runs over the runway, sheds off the enormous momentum, slows down and stops. But the flight-deck of a carrier is not even one-tenth the length of a runway. So the aircraft has to be arrested and trapped to stop its momentum. All aircraft belonging to carriers have a hook, known as a tail hook, beneath their tails. During landing, pilots touch the runway such that the hook snags a thick arresting cable present on the flight deck. The pilot has an error margin of just centimetres. If missed, the pilot increases power, takes off and makes another attempt.

Now comes the next aspect of the challenge—the runway is not only short but also unstable. It pitches up/down and rolls left/right. The pilot has to land guessing how the runway will move and then land, accordingly. The pilot has to guess that in just fractions of a second. During landing, the pilot first aligns the aircraft to the centreline of the runway from an altitude and gradually descends at a constant speed in a shallow angle; it is called approach. In the meantime, if the flight-deck pitches up, the pilot nudges the throttle to increase speed and hence altitude, and vice-versa. Similarly, if the carrier yaws, the pilot adjusts the aircraft, accordingly, and may have to make more than 100 such adjustments during the approach.

Further, landing at night time on a very short runway of a minimally-lit carrier, which is pitching, rolling, yawing and sliding, is nerve shattering and a mortal challenge. An error caused due to the pilot's judgement may cost not only his or her life but many other lives and also many aircraft.

Previous generations of pilots had only two optical clues to align the aircraft with respect to the carrier and then land safely. The first was called Fresnel Lens Optical Landing System (FLOLS) for vertical positioning of the aircraft. The second was called Centreline Lights for horizontal positioning of the aircraft. But modern-day pilots have an electronic aid called Precision Approach Landing System (PALS).

Precision Approach Landing System

PALS is really a pal for naval pilots. It has three modes: instrumented carrier landing system (ICLS) mode, automatic carrier landing system (ACLS) mode and talk-down mode.

ICLS mode. For an aircraft to land, it has to maintain a constant recommended speed, while losing altitude gradually, until touchdown on the runway. How it loses altitude with respect to the runway is called glideslope. For a runway on ground, the glideslope never changes but since the carrier rocks up and down, the glideslope also varies accordingly and is never constant. So a mere pitch up of the flight deck is drastic for the landing aircraft. Pilot of the aircraft must be made aware of this changing glideslope. This is done through a system called ICLS centred on a radar system called AN/SPN-41.

Though technically not an exact radar system, AN/SPN-41 engages in one-way transmission to the landing aircraft in Ku-band. It has a set of radars: a centreline unit and a flight deck unit. The former is situated beneath the centreline of the runway and the latter is situated slightly high on the flight-deck. Using sector scanning, both units acquire and track the approaching aircraft. The fightdeck unit and centreline unit respectively measure the aircraft's vertical and horizontal deviation from the glideslope. Then AN/SPN-41 broadcasts the positional difference in pulse mode in Ku-band in real-time.

A system called aircraft approach control system (ACCS) present in the aircraft receives these signals. It extracts the positional information of the aircraft with respect to the glideslope from these signals. It then converts these signals as a set of horizontal and vertical lines on the pilot's HUD.

The vertical line indicates the position of the aircraft with respect to the centreline of the runway. It appears in the direction that the aircraft has to move so as to align with the centreline of the runway. The horizontal line indicates how much the aircraft must gain or lose altitude to fit in the glideslope.

When these two lines form a crosshair, the aircraft can be perfectly aligned with the glideslope. The pilot, after aligning with the glideslope, can gently nudge his controls to stay in the pitching glideslope until touchdown.

Talk-down mode. In this mode, the pilot is instructed by landing signal officers (LSOs). They work from an LSO console situated at the edge of the flight deck. This console gathers all flight data of the approaching aircraft from many systems. The LSO console computes the required flight path for landing, monitors the flight path of aircraft and the difference that the pilot has to cover. It takes inputs from the integrated launch and recovery television system (ILARTS), AN/SPN-44 radar and wind-measurement system.

ILARTS. This is a camera-and-television system with all-weather capability. In simple words, its cameras can videograph both during day and night with equal clarity. ILARTS has remotely-operated cameras at many

Fig. 27: Two frames of ILARTS imagery (left) (Image courtesy: wikipedia); the dash near the left side scale is the position of the aircraft with respect to glideslope. ILARTS control centre (right) (Image courtesy: US Navy)

Fig. 28: LSOs and LSO console showing an approaching F-18 aircraft (highlighted)

places on the flight-deck. These cameras videograph the approaching aircraft along with its relative position with the horizon. ILARTS then adds glideslope crosshairs parameters and other data to that imagery. The resultant composite video is displayed at the LSO console, CATCC and other important centres like CDC. The aircraft's alignment with respect to the horizon indicates the LSO whether the aircraft should climb up or descend so as to capture the glideslope of the pitching flight deck.

Fig. 27 indicates the two scenarios of an aircraft approaching for landing. The scale-like symbol on the left indicates acceptable limits for the aircraft in the vertical axis. The dash symbol near this scale indicates the position of the aircraft. The aircraft has to be ideally at the centre of the crosshairs. The dash indicates the actual position of the aircraft with respect to the glideslope. If the aircraft is not within this envelope, it is waved off for another approach. These symbols are generated by ILARTS and fed to the LSO console.

AN/SPN-44. This is known as a range-rate radar. It detects approaching aircraft, tracks it and calculates its speed (both relative to the carrier and true speed). It then provides this data to the LSO console. Supplied with this accurate information on the speed of the approaching aircraft, LSOs can wave off the aircraft attempting to land at an unsafe speed.

Wind-measurement system. This is nothing but a traditional wind-measuring system based on an anemometer. It is used to measure headwind, tailwind and crosswind speeds. These winds can terribly affect the aircraft's flight by shifting the aircraft. Headwinds resist flight, tailwinds push the aircraft forward and crosswinds laterally move the aircraft out of glideslope. These winds are troublesome. Data from the system is fed to the LSOs, who, in turn, intimate the same to the pilot. The pilot then flies in a way offsetting the effect of these winds.

Based on these inputs, LSOs communicate with the approaching pilot, who constantly adjusts aircraft's position based on the voice commands given by LSOs.

ACLS mode. Imagine that a pilot is returning to the carrier from a battlefield, which is located 500km away, after bombing enemy targets and evading enemy air defence missiles. On the way back, he or she had to intensely fight with enemy fighter aircraft. Now, on returning to the carrier, the pilot has to land his aircraft under pitch-black conditions. The pilot's physical state is not as alert as it was when he or she left for the mission; the intense adrenalin rush has tired the pilot, making landing of the aircraft even more difficult. Anyone in this situation would dream of a system that lands the aircraft automatically without any inputs. ACLS is that dream system.

Parts of this system exist in both the carrier and the aircraft. Only ACLS-equipped aircraft can be landed automatically on a carrier. Basically, in an ACLS, autopilot of the aircraft is controlled by the carrier. For this, position of the aircraft is tracked through Ka-band tracking radar AN/SPN-46 in the carrier. Instructions for the autopilot are transmitted to the aircraft. There are two radars guiding each aircraft.

The sequence starts from a point called acquisition window during approach of the aircraft. At this point, the tracking radar acquires the aircraft and starts tracking it. At this point the pilot is indicated through cockpit indicators that the aircraft is being acquired by ACLS. The pilot then puts the aircraft under autopilot in landing mode. The tracking radar uses a conical scan antenna and continuously interrogates a radar beacon present in the aircraft. This

Fig. 29: AN/SPN-46 radar antennae

beacon responds in X-band for interrogation of the tracking radar. Replies of the beacon are continuously plotted on the ACLS computer to derive the aircraft's location with respect to the glideslope.

Instructions to the autopilot are transmitted in real-time through a UHF datalink. Autopilot has a component called approach power compensator (APC), which increases or decreases the engine's power to vary the altitude according to the glideslope requirement. The pilot has warning lights that give indications to abort landing and try for another attempt. Similarly, at any point of time, the pilot can disengage from autopilot by applying pressure on the control stick to take control of the aircraft.

The irony is that pilots do not use this mode! They say that they do not want a computer to land their aircraft. They instead use the instrumented mode and talk-down mode. So this mode only serves as a fallback option during haze and fog.

Mission planning systems

Air operations are planned taking a large number of inputs from various departments and workspaces of the carrier. The following systems help in that planning.

Aviation data management and control system (ADMACS). This is a tactical, real-time LAN used for an aviation-related information-management system. This system helps to manage the aircraft's launch and recovery operations. This network, extending to aviation-related spaces of the carrier, facilitates strike operation planners with necessary details about aircraft availability and aircraft under maintenance and repair, among others.

Aviation weapons information management systems (AWIMS). This is a data management system to collect, distribute and display information used to manage weapons inventory in a carrier.

Integrated shipboard information system (ISIS). It is a data processing and display system. It integrates all crucial information like tactical, navigational, air operations and meteorological-related data and displays these in a single usable format. To the captain of the ship, entire data regarding the carrier is displayed. Down the hierarchy, only data relevant to a particular function is displayed at various work centres.

In the fifth and concluding part we will discuss command and control operations as well as cruise control operations.

To be concluded next month

www.indiaelectronicsweek.com

Exhibition & Knowledge Partner
ELCOMA
Electric Lamp and Component Manufacturers Association of India

An EFY GROUP EVENT

A unique platform to **showcase** latest products and technologies in the world of **LEDs & Lighting.**

Only LED show in South India—a market that is known to value technical features and quality.

LEDASIA.in

January 11th-13th, 2016 • Bengaluru

www.ledasia.in

"Make in India" Offer

Special package for those who manufacture LEDs and LED Lighting products in India!

To increase your sales by exhibiting in this event, Call: **Jyotsna (011-40596605)** or write to us at: **efyexpo@efy.in**

Co-located at

INDIA ELECTRONICS WEEK

January 11th-13th, 2016
Bengaluru

Innovative Components for LED Lighting Systems

Dilin Anand is a senior assistant editor at EFY. He is B.Tech from University of Calicut, currently pursuing MBA from Christ University, Bengaluru

Abhimanyu Rathore is a content specialist at EFY

Business has two basic functions, namely, marketing and innovation. A general shift to light emitting diode (LED) lighting across markets is expected to drive the LED industry to the point where marketing will have to focus on innovative features differentiating their LED products from those of their competitors. Merely comparing with traditional lighting and citing lower power consumption might not work out. Let us take a look at what is happening to components for LED lighting apart from lower power consumption.

Better integration on dimmers and drivers

"An LED driver's performance largely depends on its compatibility with the dimming device. The driver must be designed to understand and interpret signalling by the dimming device in order for dimming to occur. Many dimming technologies used for conventional sources can also work with LEDs. These include 10V analogue, DALI, DMX and others that separate the dimming signal from AC mains voltage," says T.A. Babu, managing director, Quantum Dots Technology Pvt Ltd.

Babu explains that the most common phase-control device, which is the fan dimmer, is less compatible with dimmable LED dimmers. Consequently, pairing a fan dimmer or a similar triac based one with an LED product can be a hit or a miss. So these kind of triac based solutions can cause a host of problems like pop-on, drop-out, dead travel, ghosting audible noise and flickering. Quantum Dots offers the right dimming solution to ensure end-user visual comfort and satisfaction. Our concept dimming over line (or DOL) is an easy solution and perfectly handles the situation. It does not require separate wiring between an LED driver and a dimmer unit as it is a pluggable device.

Components for LED Lighting Launched in the Last One Year

LED driver	Short feature	Company name	Feature	Application
TLC592x-Q1	Automotive 16-bit constant-current LED sink driver	Texas Instruments	• Qualified for automotive applications • AEC-Q100 Qualified with following results: 1. Device temperature grade 1: –40°C to 125°C ambient operating temperature range 2. Device HBM ESD classification level 2 • 16 constant-current output channels • Output current adjusted by an external resistor • Constant output current range: 5mA to 120mA • Constant output current invariant to load voltage change • Open-load, shorted-load and over-temperature detection • 256-step programmable global current gain • Excellent output current accuracy: 1. Between channels: < ±6% (maximum), 10mA to 50mA 2. Between ICs: < ±6% (maximum), 10mA to 50mA • 30MHz clock frequency • Schmitt trigger input • 3.3V or 5V supply voltage • Thermal shutdown for over-temperature protection • ESD performance: 2kV HBM	• General LED lighting applications • LED display systems • LED signage • Automotive LED lighting • White goods
ADP8140	4-channel high-current LED driver with adaptable power control	Analog Devices	• Highly-integrated feature set for a high-brightness LED driver solution with minimal external components • Four current sink channels with an adjustable current from 125μA to 500mA • Analogue and PWM dimming inputs • Analogue and PWM LED current outputs • Two per cent (maximum) matching between LED channels • Five per cent (maximum) LED current accuracy • Operates from VIN of 3V to 30V; higher voltages easily accomplished with an external Zener diode • Operates with LED anode supply voltages up to 100V DC • Feedback output controls external power source for optimal efficiency and safety • Multiple ADP8140 IC operation in parallel to control one power supply • Integrated error amplifier for secondary side control of isolated power supplies • Easy connection of a temperature thermistor or light sensor • Provides robust protection of the entire system 1. Power supply over-voltage protection 2. LED over-temperature protection 3. LED short-circuit protection 4. LED open-circuit protection 5. IC over-temperature protection 6. Shorted ISET protection 7. Open ISET and EN protection • Standby mode for low current consumption • Fault indicator output • Small, thermally-enhanced LFCSP package (4mm×4 mm)	• High brightness LED lighting • Large format LED backlighting
ADP8866	Charge pump-driven 9-channel LED driver with automated LED lighting effects	Analog Devices	• Charge pump with automatic gain selection of 1×, 1.5× and 2× for maximum efficiency • 92 per cent peak efficiency • Nine independent and programmable LED drivers • Each driver is capable of 25mA (full-scale) • Each driver has 7-bits (128 levels) of non-linear current settings • Standby mode for <1μA current consumption • 16 programmable fade-in and fade-out times (0.0 sec to 1.75 sec) with choice of square or cubic rates • Automated and customisable LED blinking • Unique heartbeat mode for programmable double pulse lighting effects on four channels (D6 to D9) • PWM input for implementing content adjustable brightness control (cABC) • I2C compatible interface for all programming • Dedicated reset pin and built-in power on reset (POR) • Short-circuit, over-voltage and over-temperature protection • Internal soft start to limit inrush currents • Input to output isolation during faults or shutdown • Operates down to VIN=2.5V, with under-voltage lockout (UVLO) at 1.9 • Small lead frame chip scale package (LFCSP)	• Mobile display backlighting • Mobile phone keypad backlighting • LED indication and status lights • Automated LED blinking

Continued on next page...

Continued from previous page...

LED driver	Short feature	Company name	Feature	Application
AL1791/ 1792/ 1793/ 1794 [AL179x]	Single/dual/triple/ quad-channel current-ratio-opti-mised LED driver with analogue and PWM dimming U-DFN -4030-14	Diodes Inc.	• Input voltage range: 6.5V to 30V • 1/2/3/4-channel LED drivers: inde-pendent analogue or PWM dimming control for each channel • Reference current: adjustable by an external reference resistor • Ratio-optimised currents for four independent LED channels (AL1794 only suitable for tunable white and tunable colour) • Low standby power: with EN pin • e-flicker-free high-frequency PWM dimming with deep dimming • Capability: supports 10KHz down to 1.0 per cent, 4KHz down to 0.4 per cent or 1KHz down to 0.1 per cent • Internal protections: UVLO, LED string open/short protection • Over-temperature protection: thermal shutdown and auto thermal recovery • Fault reporting: UVLO, over-tempera-ture protection, open and short LED power good reporting • Low system bills of material cost • Ambient temperature range: -40°C to +125°C • Totally lead-free and fully RoHS-compliant • Halogen and antimony free: green device	• 1-channel dimmable smart connected light (SCL) bulbs • 2-channel tunable white SCL bulbs • 3-channel tunable white or colour SCL bulbs • 4-channel tunable white and colour SCL bulbs • Smart connected LED tubes, panel lights, troffers and ceiling lights
TLD 2314EL	Litix basic (scal-able linear current sources family for automotive LED applications)	Infineon	• One to three output channels; typ. 60mA to 180mA • Supply voltage: 5.5V-40V • Integrated protection and diagnostic feature • Stable and reliable LED brightness • PWM via external PWM signal and optional via integrated PWM engine	• Automotive exterior and interior LED light-ing • Low to medium power LED applications, for example, position, turn, tail, stop, CHMSL, RCL, reverse, fog or dome
NSI45030 T1G, NSV45030 T1G	Constantcurrent regulator and LED driver 45V, 30mA + 15 per cent, 460mW package	On Semicon-ductor	• Robust power package: 460mW • Wide operating voltage range • Immediate turn on • Voltage surge suppressing: protecting LEDs • Self Biased Transistor technology • Negative temperature coefficient • NSV prefix for automotive and other applications requiring unique site and control change requirements; • AEC–Q101 qualified and PPAP capable* • Devices are Pb-free, halogen-free/ BFR-free and RoHS-compliant	• Automobile: Chevron side mirror markers, clusters, display and instrument backlight-ing, CHMSL, map lights • AC lighting panels, display signage, decorative lighting, channel lettering • Switch contact wetting
LYT Switch-0, LYT Switch-2, LYT Switch-3	LYTSwitch LED driver ICs	Power Integration	• LYTSwitch-0 family of LED driver ICs is specifically designed for non-isolated non-dimming LED bulbs and T8 tube applications • LYTSwitch-2 LED driver ICs dramati-cally simplifies low-power constant current LED drivers by eliminating the optocoupler and secondary control circuitry • LYTSwitch-4 Family of LED driver ICs enables off-line LED drivers with high power factor, which easily meet international requirements for THD and harmonics	—

MD-SIG Standards Released for Lighting LED Driver Interface

Specifications for a universal electrical interface between LED lighting modules and their power supplies have been recently released by Module-Driver Interface Special Interest Group (MD-SIG). This standard is supported by industry players like Osram, Panasonic, Philips and Tridonic.

According to the press release, "The standard is called LEDset1 edition1.0 (a 3-wire interface) power and Iset, and a return for both. The specification also allows for separate returns for mains and set currents to avoid setting errors due to return voltage drops."

Adding further, the release states that Iset has nothing to do with dimming. It is provided so that the LED module can indicate its maximum working current to the driver. It does this by drawing Imax/1000 from Iset. The only time any modulation of Iset is allowed is if the LED module is overheating, when it is permitted to reduce its own supply current by reducing Iset.

Official names of the three terminals are LED+, LEDset and LED, as stated in the release. The optional Iset return is GRNset. Additionally, the LED module and driver must be marked accordingly. The recommended wire colours are red, white and black, respectively. Although LEDset1 specifies a universal analogue signalling protocol, it does not cover the matching of the driver output voltage and current capability with LED module's needs.

"The power interface specification describes driving capabilities like voltage, current and power ranges of LED control gears and respective LED module operating requirements," says the SIG. "It simplifies matching and comparing output and input parameters with harmonised terms and definitions."

Source: ChipsnWafers.com

Quantum dots has also brought out a new LED driver named SEFA which functions in three modes of operation, namely, BCM,CCM and DCM. Babu explains that there is no complexity in the design part and it does not suffer from high voltage stress in the power switch.

Infineon has also brought out ICL8105 single-stage fly-back controller with an optional burst-mode control scheme that helps extend the dimming range. It is aligned to line frequency to avoid noise, flickering or shimmering.

JSK Innovative Technology Pvt Ltd has just completed their research and development of a phase-cut dimmable driver with a range starting from 15V to 55V, current range of 100mA to 700mA and above 0.95 power factor correction (PFC).

Fairchild has also announced the launch of their phase-cut dimmable single-stage LED driver integrated circuit (IC) called FL7733A. This is a highly-integrated pulse width modulator (PWM) controller that provides tight-tolerance constant-current output using TRUECURRENT technology. Fairchild claims that this LED driver can enable designs with constant current tolerance of less than ±1 per cent over the universal line voltage range.

High intensity. Toshiba Semiconductor has launched TL1L4 series of high-power white LEDs that achieve luminous flux of 140lm (min) as compared to 130lm (min) previously.

Plessey has announced a range of MaGIC LED die manufactured on GaN-on-Silicon. This process technology will form the base for their applications-specific LEDs.

Circuit protection. "We have seen many automation systems getting damaged due to the reverse current of drivers. So our new range of dimmable drivers have an opto-isolation circuit designed into it that protects the system from reverse current in the dimmable driver," says Rakesh Shah, managing director, JSK Innovative Technology Pvt Ltd (JSK Urja).

Littlefuse has launched their LSP05 and LSP10 thermally-protected surge protective devices designed for outdoor and commercial LED fixtures. These devices use thermally-protected varistor technology for transient over-voltage protection.

Better packaging

"Since last year, some changes that have taken place include the change from emitter technology to chip on board (CoB) technology and different soldering processes followed by various chip manufacturers," says Siva Satheesh, managing director, and Abdul Basith, executive director, Euro lights, India.

An active PFC greater than 0.95 is claimed to be attainable with the newly-launched RCOB LED drivers for CoB LEDs from RECOM. Active PFC diminishes total harmonics, automatically corrects for AC input voltage and is capable of delivering a full range of input voltage.

LED Engin claims that they have used an improved LZP package design and a low thermal resistance per package footprint of 0.5°C/W to build a 25-die, 80W emitter that can deliver 3800lm from a

MAJOR CONTRIBUTORS TO THIS REPORT

Abdul Basith, executive director, Euro Lights, India

G. Jeganathan, director, GTP Equipments India Pvt Ltd

I. Hari Prasad, Omtronics

Joy Biswas, product manager, Forbix Semicon

Rakesh Shah, managing director, JSK Innovative Technology Pvt Ltd (JSK Urja)

Siva Satheesh, managing director, Euro Lights, India

T.A. Babu, managing director, Quantum Dots Technology Pvt Ltd

6.2mm × 6.2mm light emitting area on 12mm × 12mm emitter footprint.

Coloured LED chips

City farming or vertical farming uses a cultivation process where crops are grown in small interior areas using LED arrays to provide an optimal light spectrum. This is done by mixing LEDs of various colours for boosting growth throughout the year, irrespective of how the Sun is shining.

The problem of beam halos and mismatched, unmixed colours is claimed to be resolved here by using one focal length for all colours. Cree announced XQ-E high-intensity LEDs that deliver maximum candelas through secondary optics, enabling lighting manufacturers to radically reduce system size and power of high-intensity colour applications.

Adding further, the company release mentions that it is built on Cree's SC5 technology platform and features a combination of optical symmetry, consistent design across all colours, and a tiny 1.6mm × 1.6mm footprint simplifies manufacturing and design while providing excellent colour mixing.

Investing in longevity

Lighting products started off as gas-filled tubes with inverters, which were then followed by compact fluorescent lamps. "Components that go in LED lighting products today dissipate comparatively less heat and do not use any chemical gases," explains G. Jeganathan, director, GTP Equipments India Pvt Ltd. However, heat still affects the reliability of LEDs by a significant amount.

"The brand of the component is not really connected to quality. Any single component failure will be a cost to the company, and that hurts its image. In our case, we have set up complicated test equipment and systems to make sure every LED that goes through us is tested with different current variations, switching frequencies and environmental conditions," says Joy Biswas, product manager, Forbix Semicon.

Heat is definitely a problem for these devices. "Bulbs that come with aluminium heat-sinks do a good job of dissipating heat. The more heat these dissipate, the more reliable are the bulbs. This is because excess heat can damage the internals. For example, copper wiring is affected by continuous heat over a period of time, which can end up tearing the transformer if too much heat resides inside the unit," says Biswas. Now that you know this, consider the fact that quite a few inexpensive LED bulbs come with plastic heat-sink components!

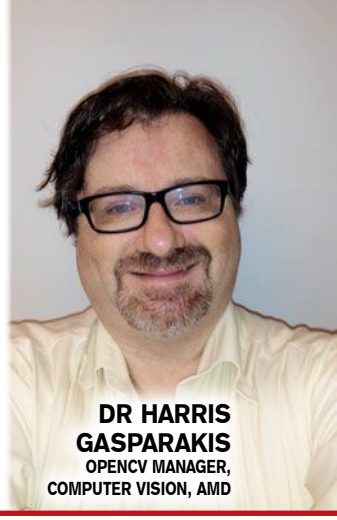
What next

"In the future, lumens per watt will improve at least five to ten times over conventional LEDs, while cost per watt will dramatically come down. Multi Junction Technology (MJT) LEDs are more reliable than conventional LEDs today," says I. Hari Prasad from OMTRONICS LED Lighting Solutions. Engineers using MJT LEDs will be able to eliminate drivers or converters in their designs. Prasad also explains that MJTs have a longer life and enjoy low-distortion power by having one of the lowest total harmonic distortion along with the highest power factors. ●

Computing:

"We are at the dawn of an era that transcends CPU and GPU computing"

Open computer vision (OpenCV) is an image-processing software that is widely used and heavily documented. With the latest version having participation from big players like Intel and AMD, let us find out about the open computer language (OpenCL) acceleration layer added to it. Dr Harris Gasparakis, OpenCV manager, Computer Vision, AMD, speaks with Priya Ravindran from EFY about graphical processing and AMD's contribution to OpenCV



DR HARRIS GASPARAKIS
OPENCV MANAGER, COMPUTER VISION, AMD

Q. How has computing evolved?

A. The modern trend embodied by graphical processing units (GPUs) is to employ scalar architectures, support multiple concurrent threads and let the compiler and runtime do their magic. In fact, we are at the dawn of an era that transcends central processing unit (CPU) and GPU computing by combining both. I am talking about heterogeneous computing, where CPUs and GPUs are not only integrated on the same die but these efficiently synchronise access and operate on the same data from main memory, without redundant data copies. OpenCL 2.0 provides the application peripheral interface that enables this.

Q. What are the main points to keep in mind while creating an OpenCL implementation?

A. There are two main elements in creating an OpenCL implementation or port of any library. First, you need to make sure that data makes it to the processing cores. For example, in a discrete GPU, you need to explicitly copy the data to onboard memory from the main memory. This approach also works on an integrated device but is not efficient.

The other element in porting a library to OpenCL is porting the processing logic to OpenCL kernel syntax.

Q. What are the main differences between OpenCV-without-OpenCL and OpenCV-with-OpenCL? What new capabilities do these offer?

A. It is not about new functionalities. Rather, it is about accelerating the most common existing functionality to take advantage of GPUs. For copying data to the onboard memory on an integrated GPU, you would want to use zero copy, that is, you would want the GPU to use the same data as the CPU. This was possible using OpenCL 1.2 but is significantly easier with OpenCL 2.0. In OpenCV, our goal was to create an implementation that would work on all OpenCL-capable devices, such as integrated or discreet GPUs.

Q. Why did you go with the transparent acceleration layer?

A. The goal of the transparent acceleration layer (T-API) was to enable people to write their code only once. If an OpenCL-capable device is available, it will be used. Otherwise, the fallback is CPU execution, which can also include accelerators like integrated performance primtives or intrinsics like advanced vector extensions/streaming SIMD extensions (AVX/SSE).

Detection of OpenCL devices happens at runtime, dynamically. Integration inside OpenCV was a significant effort. We sponsored the maintainers of OpenCV and they became very excited with the vision and carried it forward.

Q. How does this interface work?

A. My main idea was to introduce a new data structure, universal or unified matrix (Umat) to replace Mat data structure, which was historically the basic image data structure in OpenCV. The goal was to hide data locality under UMat hood in a way that is appropriate for each class of device. For example, in the case of discreet GPUs, UMat would have the responsibility for synchronising data between the CPU and GPU by making a copy.

Q. To what effect can embedded engineers use OpenCV?

A. Traditionally, OpenCV has been great for prototyping, given the wealth of algorithms that have been implemented. OpenCV 3.0 brought about a general re-architecture, further strengthening the library in terms of having it organised in a more modular fashion.

Embedded vendors have now realised that there are credible, high-performance and relatively low-cost embedded solutions using GPUs. In the cost, one has to factor in the total cost of ownership, as developing in generic languages like OpenCL is arguably significantly cheaper than developing for a specialised processor.

Q. What is the next step forward for OpenCV?

A. The next step in OpenCV will be to take full advantage of the advanced features of OpenCL 2.0. I am particularly excited about the prospect of extensively using fine-grain support vector machine (SVM), as this would enable efficient hybrid imaging pipelines, where one would be able to mix and match CPU and GPU execution, with no performance penalty. ●

EXIDE

Sure power everywhere

If you are looking for UPS power make sure you have the right battery. Environmental conditions, frequency and duration of power cuts, maintenance, reliability and budget, all play a part in determining the choice. Only Exide has the range of AGM VRLA, Tubular GEL VRLA and Tubular Flooded batteries to ensure you get what is right for you. Why compromise? Remember your UPS is only as good as its battery.

•All batteries shown are cadmium free

For enquiries, SMS "IUPS" to 9211805454

EXIDE Industries Ltd., Industrial Marketing: 6A Hatibagan Road, Entally, Kolkata - 700 014, Phone: 2286 6158/6159, E-mail: indlcare@exide.co.in

Visit us at: www.exide4u.com

Microcontrollers:

"Inclusion of security is becoming necessary as more systems become connected"

Several microcontroller (MCU) markets are transitioning to higher-performance technologies as designers seek better MCUs for the Internet of Things (IoT). Which high-level trends are defining the future of MCUs? Hear it from the makers of PowerVR graphics architecture as Alexandru Voica, senior technology marketing specialist, Imagination Technologies, speaks with Dilin Anand of EFY

ALEXANDRU VOICA
SENIOR TECHNOLOGY MARKETING SPECIALIST, IMAGINATION TECHNOLOGIES

Q. What are some innovative SoCs or other chips for new niches that you have found to be exciting?

A. There have been several systems on chips (SoCs) and platforms released recently that are really exciting. I would start with Samsung ARTIK 1, an IoT development board that uses a dual-core MIPS M-class central processing unit (CPU) cluster.

Ingenic M200 is another great example of an innovative SoC built from the ground up for wearable devices. It implements a power-saving hardware architecture where a high-performance MIPS CPU clocked at 1.2GHz tackles most of the heavy lifting, while less-demanding tasks are handled by a secondary low-power 300MHz MIPS CPU.

Finally, Baikal-T1 processor is the first Russian offering for the communications market to use a MIPS P-class Warrior CPU, boasting highly-competitive properties in terms of performance, technology node and compatibility.

Q. What are the most popular features that you have seen in these IoT-targeted chips?

A. Many IoT-focused chips are integrating advanced functionalities to reduce power and manufacturing costs. One example is the emergence of the sensor-fusion hub. Another big trend is the addition of multi-standard radio on-chip, particularly in connected applications. Inclusion of security is becoming necessary as more systems become connected.

Q. Any shift in the way of thinking of chip vendors as they prepare to fully tackle the IoT space?

A. New or established, every semiconductor vendor needs a new paradigm to solve four critical issues in the IoT, namely, design time, differentiation, time-to-revenue and design cost.

In the IoT market, consumers have high expectations; devices need to be affordable, power-efficient and must work out of the box. To address these issues, we have partnered with Taiwan Semiconductor Manufacturing Co. to create multiple IoT sub-systems using MIPS, PowerVR and Ensigma that are optimised for multiple process technologies, from 55nm to 10nm. Using these intellectual property (IP) platforms, semiconductor manufacturers can address the widest range of high-growth markets, from wearables and sensors to mobile, connected cars, cloud processing and beyond.

Q. How would you define the design of an MCU as we move further towards IoT applications?

A. There are a few essential metrics that define the design of any MCU—ease of software development, low power consumption, wide input/output functionality and performance efficiency—and their importance varies with the target application.

Industrial automation and electronic control units markets, for example, require tight and deterministic operations in safety-critical conditions. For automotive infotainment, those requirements are more relaxed in favour of better raw performance needed to process multimedia data. In the case of smartcities and home automation, having a complete, fully-integrated solution (MCU + baseband radio + radio frequency) is extremely important to accelerate time-to-market.

Q. How are the latest chips reducing power consumption, and what changes are driving this?

A. MIPS is a pure reduced-instruction-set-computer architecture that achieves better performance at lower frequencies and in a smaller area by using power-saving instructions, enabling fine-grain control over all parts of the chip. All MIPS CPUs implement fine-grain clocks, gating to reduce dynamic power and voltage/frequency scaling to allow on-the-fly clock-frequency changes.

The multi-threaded technology in MIPS I-class cores combines multiple processing elements in a single processor core, providing performance (and lower area/power) that would otherwise be required of multiple processor cores.

Q. With Xiaomi's plans to launch its own smartphone processor through Leadcore, there seems to be a bigger focus on custom chips designed by fabless design houses. Your views?

A. Taking the vertically-integrated route can offer substantial advantages, if done right. Companies that are vertically integrated have a very tight grip on many aspects of manufacturing and there is a lot to be gained from the synergies that result from this. ●

This Month's DVD Contents

This month's DVD is packed with some new, updated and engaging electronics design automation (EDA) tools for design and simulation along with informative videos and source codes of projects featured in the do-it-yourself section

ABHISHEK A. MUTHA

BSch3V schematic capture (version 0.82.01)

BSch3V is a schematic capture program for Windows Vista, 7 and 8. Bsch is short for Basic Schematic as this software allows users to work on basic functions. The current version included in the DVD comprises LCoV component library editor (version 0.82.01), PL3W parts list generator (version 0.81.10), NL3W netlist generator (version 0.81.10), NUT3W automatic numbering software (version 0.82.01), CE3Search searching utility for CE3 files (version 0.81.10) and the component library.

LogicCircuit (version 2.15.10.21)

This is a free, open source educational software for designing and simulating digital logic circuits. With an intuitive graphical user interface, it allows you to create unrestricted circuit hierarchy with multi-bit buses, debug circuits behaviour with oscilloscopes and navigate running circuits hierarchy. This Windows application requires Microsoft .NET Framework 4.5 or higher. In the latest version, a bug in the initialisation of circuit run was fixed.

Qfsm, the finite-state machine designer (version 0.54)

Developed by Stefan Duffner and Rainer Strobel, Qfsm is a graphical editor for finite-state machines written in C++ using graphical toolkit Qt. In the latest version, some bugs have been fixed and a new function to export State Machine Compiler (.sm) files has been added. Users can export diagrams in Encapsulated PostScript (EPS), Scalable Vector Graphics (SVG) and Portable Network Graphics (PNG) formats. Some other features include drawing, editing and printing diagrams, integrity check, Hardware Description Language (HDL) export in various formats, interactive simulation and state machine compiler (SMC) export.

OpenAPC (version 4.1-1)

There are many kinds of viruses out there that manipulate industrial control systems including connected programmable logic controllers (PLCs). OpenAPC keeps worms and other buffer-overflow dependent risks away from Supervisory Control And Data Acquisition (SCADA) and PLC systems. It is an open source advanced process control (APC) solution that is highly flexible and configurable, and covers a wide range of automation, visualisation and process control tasks for home control as well as industrial automation. It consists of several sub-components such as CNConstruct and BeamConstruct that are specialised for different tasks.

eSim (version 1.0.1)

Previously known as Oscad/FreeEDA, eSim is an open source EDA tool for circuit design, simulation, analysis and PCB design. An article has been published in this month's magazine for an in-depth understanding of the software. ●

The author is a senior technical correspondent at EFY

Some popular resources

WinSCP (version 5.7.6). WinSCP is an open source free SFTP, FTP, WebDAV and SCP client for Windows. Its main function is file transfer between a local and a remote computer. The latest version improves interoperability with several SFTP and FTP servers and fixes several bugs.

Angry IP scanner (version 3.4). Angry IP scanner is an extremely fast IP address and port scanner. It can scan IP addresses in any range or port. It does not require any installations and can be freely copied and used anywhere.

Password Safe (version 3.37.1). Password Safe is a simple and secure password-management application available under open source approved licence.

Eraser (version 6.0.10.2620). Eraser is an advanced security tool for Windows that allows you to completely remove sensitive data from your hard drive by overwriting it several times with carefully selected patterns.

KeePass (version 2.30). KeePass is a free, open source, lightweight and easy-to-use password manager, which helps you to manage your passwords in a secure way. You can put all your passwords in one database, which is locked with one master key or a key file. You only have to remember one single master password or select the key file to unlock the whole database.

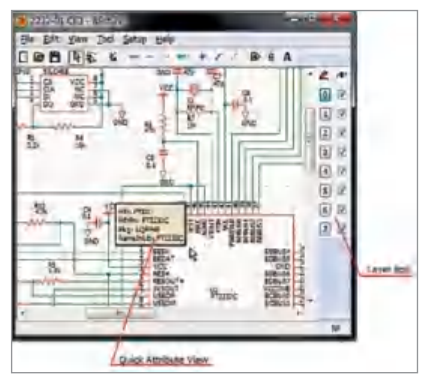


Fig. 1: Screenshot of BSch3V schematic capture tool

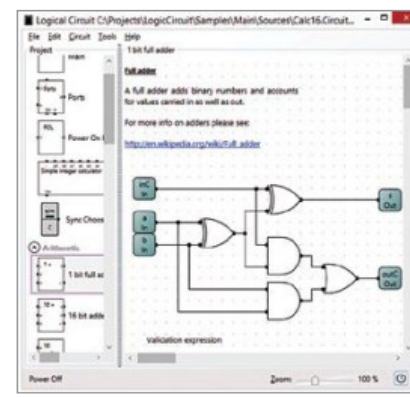


Fig. 2: A sample circuit in LogicCircuit interface

VIPER: The Python IoT Design Suite

PRIYA RAVINDRAN

VIPER, the acronym for Viper Is Python Embedded in Real-Time, is a solution for making your design interactive and connected to the Internet of Things (IoT) easily. The package offers a set of software and hardware tools to seamlessly implement your embedded design ideas, without worrying about actually putting together stuff using solders to make your design work.

The suite is open source and released under general-public licence version 3 (GPL3), Apache2 and Massachusetts Institute of Technology (MIT) licences, depending on the libraries and codes put to use. For commercial usage, their respective websites offer a separate package along with added support. Built to be cross-platform, VIPER is a development suite for high-level design of interactive objects, artistic installations and Internet/cloud-connected devices.

What it offers

VIPER provides a platform for developing embedded designs in Python, using paradigms and features typical of personal computers and mobile programming. It lets you make your object connected and smart with just a few lines of code and almost no wiring.

Multi-board compatibility. Converting your product idea into a prototype can be easily achieved with VIPER, which can run on all 32-bit ARM processors and professional hardware based on ARM microcontrollers (MCUs). It also offers support to do-it-yourself MCU boards like Arduino, UDOO, ST Nucleo, Particle and all Spark products. Creators of VIPER, Things On Internet (TOI), have also come up with their own TOI shield, a multi-sensor board with ready-to-plug communication ports. The shield claims to be a first of its kind, enabling plugging on Arduino and Particle boards without any adaptors. To program using VIPER, you just have to make sure you install the universal serial bus (USB) driver corresponding to your board. The board has to 'viperised' before you can use it, and this involves installing VIPER virtual machine (VM) and the required real-time operating system (RTOS) on the board.

A multi-threaded RTOS. Using ChibiOS as the embedded device OS, VIPER permits hardware-architecture-independent design implementation. Implementing multi-threading on top of the OS has brought a new dimension to VIPER. Every VIPER thread is an RTOS thread with a specific priority, and these are synchronised using a global interpreter lock that is released when a higher priority one requests processing.

Elegant handling of peripherals. Abstraction layer of ChibiOS supports basic peripherals like general-purpose input/output (I/O), pulse width modulation (PWM), analogue-to-digital converters, inter-integrated circuits, serial peripheral interfaces, timers, external interrupts, serials and USBs. The required interface codes can be found as modules in Python library. For other drivers, all that is required is C-function that can be embedded in the script. What this means is that, most Raspberry Pi drivers you work with can be easily adapted and ported into VIPER Python scripts.

Libraries for scripting. Useful modules from the standard Python library, like json, math and urlparse, have been ported to VIPER, and these can be used while working with codes. Along with these, VIPER adds a set of built-ins that can be used directly. You can also import modules while working with sensors, shields or even specific ones pertaining to VIPER threads and connections.

Efficient management. Memory and space management are up to the mark with VIPER. With an intentional effort at minimising object space, built-in functions occupy just four bytes, against 16 for a normal one. It implements a novel memory management system and a memory allocator

The Hello World of Embedded Devices: A Blinking LED Program

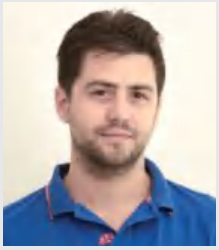
```
##############################################
# Led Blink
# Created by VIPER Team 2015 CC
# Authors: G. Baldi, D. Mazzei
##############################################

# D0 to D127 represent the names of digital pins
# On most Arduino-like boards pin D13 has an on-board LED connected.
# Initialise a digital pin as an output to drive the connected LED.

pinMode(D13,OUTPUT)

# loop forever
while True:
    digitalWrite(D13,HIGH)  # turn the LED ON by making the voltage HIGH
    sleep(1000)             # wait for a second
    digitalWrite(D13,LOW) # turn the LED OFF by making the voltage LOW
    sleep(1000)             # wait for a second
```

Here is what Hack a Day had to say about VIPER on their Kickstarter page

"Part of getting IoT projects off the ground is overcoming the language barrier between humans who want to easily prototype complex ideas and hardware that wants specific instructions. A company called Things On Internet (TOI) has created VIPER, a system to easily program any Spark Core, UDOO or Arduino Due with Python."

"VIPER enables developing embedded and IoT solutions in a faster and highly re-usable way. Hence, we believe that VIPER will be the Android for the embedded world."

—Daniele Mazzei, VIPER co-founder and system integration designer



with specialised garbage collector to suit embedded operations.

VIPER converts local and global names to 16-bit integers instead of saving it as strings. While this saves resources spent by the MCU, names information is not available during runtime. Also, for time-constrained functions, you can write the fast code in C and call it from Python script.

Customisability. As the embedded machine being used is virtual, you can customise it to your application. Customisation referred to here is in terms of the number of drivers initialised, functioning of ports, level of optimisation and so on. This results in saving precious flash and random access memory.

VIPER tools. A compiler reads the input code and produces an optimised byte-code that can be understood by the VM. Optimisation here involves saving code objects on flash for direct access and analysing the code for static reachability. A VM builder allows you to configure and create a VM that suits your application better, for better functionality and to help you work within your constraints.

There is also a VIPER Up-linker that prepares the packages required by the VM for executing the expected design. All of these are integrated into the integrated development environment (IDE) to enable one-click execution of the entire process.

The latest release, VIPER 0.2.0.0009, also includes a photon Wi-Fi driver, Adafruit neopixel light emitting diode (LED) matrix driver, an infrared read-and-write control module, drivers for servo-motor and thermal printer and an animation module. Inclusion of these additional features promises an enhanced and smooth user experience.

What VIPER Suite is

A comprehensive development environment, VIPER Suite consists of three main components. With the help of these you can easily and quickly design your embedded system and integrate with sensors and the cloud. Let us see each of these components one by one.

VIPER IDE. A browser based dedicated development environment, the IDE provides a platform for developing your Python code and managing your boards. It includes a compiler, debugger and an editor, alongside tutorials and example projects for an easy learning experience. A code editor based on Code Mirror makes it easy to navigate through your code, while providing a comfortable user interface. The integrated debugger has built-in support for exceptions, which although not Python exceptions, are faster to raise and handle. The IDE also allows you to inspect low-level VIPER VM byte-codes.

A serial console allows you to control communication with ports on the board. Managing connected devices is easy, thanks to the board management toolbar. A registered user is also automatically connected to VIPER cloud, where she or he can store data and access sessions from different devices/places, without affecting continuity. Thus, all you need to do is develop scripts locally using the IDE and sync it with the cloud.

VIPER VM. The aim of VIPER VM is to bring Python into the embedded world. It uses a sub-set of Python, neglecting features not required by the embedded world. What the VM lets you do is develop board-independent Python scripts that can be easily re-used and simulated. VIPER supports most high-level features of Python like modules, classes, multi-threading, callback, timers and exceptions. In addition to these, it allows one to use custom hardware-related features like interrupts, PWM and digital I/O.

VIPER app. This is how you access your object. The app provides an interface for all network- or Bluetooth-powered VIPER objects. Easily downloadable through Android, iTunes or Windows stores, the app allows you to control your object using your smartphone or tablet. On launching the app, it automatically displays a list of viperised devices in the vicinity, which you can then connect to.

Although VIPER is in Python, app interfaces are based on Hyper Text Mark-up Language (HTML) or Java, making it easy for you to connect to your MCU or mobiles. You do not need to write any separate code for Android or iOS.

How to start using VIPER

With a zero-install development environment, all you need to do is unpack the packages that come with VIPER. Or, you can simply load the necessities from this month's DVD and start using it right away.

Find example projects on VIPER hackster platform *(www.hackster.io/viper)*. Clear your doubts that crop up by posting on their community forum *(www.community.viperize.it)*. For anything else, get onto their website, *www.viperize.it* ●

Priya Ravindran is a technical journalist at EFY

Biological Image Analysis **Using Fiji**

JAI SACHITH PAUL

In the last couple of issues we dealt with biomedical signal-processing software, namely, BioSig and FieldTrip. Fiji Is Just ImageJ software, abbreviated as Fiji, is a smart open source platform for the analysis of biomedical data. As the name indicates, it is a distribution of ImageJ package with many useful plugins. The latest version of this software licensed under GNU public licence version 2 is bundled in the DVD accompanying this month's *EFY Plus*.

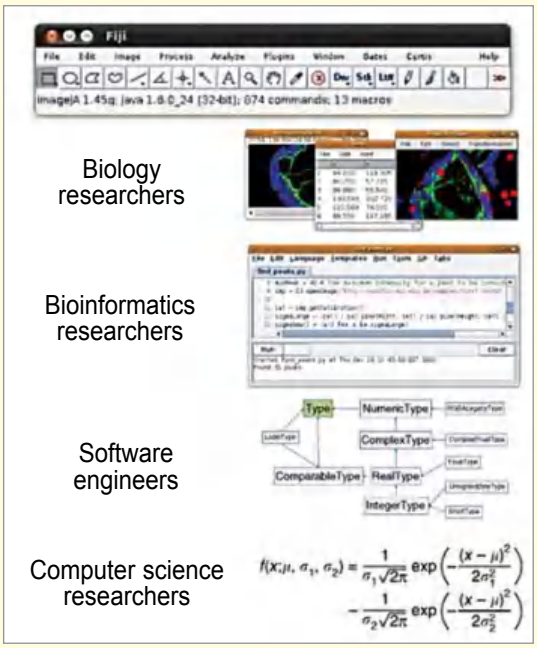


Fig. 1: Fiji is a truly interdisciplinary software connecting engineers and researchers from various disciplines

Why Fiji

Recent advances in computer vision and technology have helped immensely in the analysis of biological images. Computerised analysis of images makes it possible to overcome the limitations of human observations, providing relevant inference from either large sets of biological samples or high-resolution information of smaller samples. Image data is registered from various overlapping parts, segmented to capture biologically-relevant features, tracked across space and time, and compared with other specimen.

There are a handful of software in the market that deal with biological images. These include commercial ones like Amira and Volocity and open source ones including ImageJ and BioImageXD. While commercial platforms provide an easy interface, inner details of image-processing algorithms are hidden from the user, which is not recommended when it comes to research in bioimage informatics.

If we take the case of an open source software like ImageJ, it is made by and for biologists. Therefore the tool does not follow the principles of modern software engineering, making it less attractive for computer scientists.

Project Fiji is built on the architecture of ImageJ, with an aim to help researchers to develop innovative, cutting-edge solutions for biological-image analysis. Powerful libraries in Fiji ensure that image-analysis tools are frequently updated with the latest algorithms.

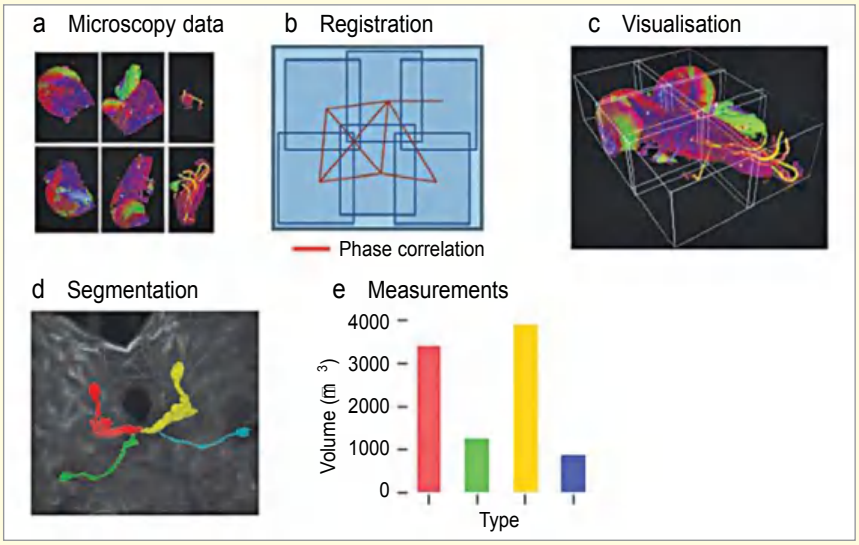


Fig. 2: Some of the main techniques used in the software (a) Stitching plugins helps in gathering different views of the microscopic data, (b) Image registration, (c) Visualisation, (d) Image segmentation and (e) Measurements (Image courtesy: Article titled 'Fiji: An open source platform for biological-image analysis' by Johannes Schindelin et al)

Attracting researchers from multiple disciplines

The software proves to be a very useful tool for researchers from various disciples. If you are a researcher in biology, the point-and-click interface provided by Fiji allows you to interact with multi-dimensional data. This interface is quite similar to the one provided by ImageJ. A bio-informatician with sound programming skills can make use of the available scripting languages for constructing image-processing pipelines. This is possible with the help of Script Editor plugin.

Software at a glance

Name: Fiji (Fiji Is Just ImageJ)
Type: Image analysis and processing package
Main developers: Johannes Schindelin, Albert Cardona, Mark Longair and Benjamin Schmid
Supported platforms: Windows, Linux and Mac OS X, Intel 32-bit or 64-bit, with limited support for Mac OS X/PPC
Licence: GPL v2
For more information: *www.fiji.sc*

If you are an engineer, you can use this tool in more interesting ways. You can make use of the existing source code to develop a much more efficient and high-performing algorithm and spread it around the world for free. The software bundles standard libraries and builds bridges to other platforms with the help of plugins. As a computer scientist, you can make use of the tool for rapid prototyping of generic algorithms.

Some noteworthy features

Fiji is essentially an enhancement of ImageJ software with many useful plugins that aid in biological-image processing. Therefore it shares many features with ImageJ tool.

Batch processing. Scripts and macros in Fiji have the ability to reuse their functionality in multiple images. The user can at first create a basic macro that operates on the active image and then apply the macro to a group of images via a batch process.

Script editor. When a user writes the script in any of the languages supported by the software, script editor is of immense use. Text editing features such as auto-intend and configurable white-space options, programming features like output console and syntax highlighting, language specific tools and interfaces are provided.

The entire process of writing the script is as simple as starting the script editor, choosing the preferred language, and writing and running the script.

Plugin integration. More elaborate plugin integration is possible in Fiji because most Fiji methods are implemented as software libraries using ImgLib for data representation. As all plugins run on a common platform, output of one plugin can serve as input to another.

Main techniques used

Let us now take a look at some of the main techniques used for image processing using this software.

Colocalisation. If you are having two sets of image samples and wish to find out the colocalisation between these, Fiji provides sufficient methods for the same. The software uses Coloc 2 plugin for pixel intensity correlation over space methods including Pearson, Manders, Costes and Li. Colocalisation finds significant applications in scatterplots, analysis, automatic thresholding and statistical significance testing.

Segmentation. Image segmentation involves assigning a label to each pixel of an image. Pixels containing identical labels have some visual characteristics in common. The first step involved in image segmentation is the pre-processing of data with the help of sufficient filters. This helps in making thresholding more effective. Auto-thresholding is then applied, followed by creation and manipulation of a mask. A selection contained in a mask is created and transferred to the original image. Finally, resultant data is analysed.

Registration. This involves transforming different samples or views of the same data into a common coordinate system. For comparison or integration of data obtained from different measurements, image registration is necessary. Stitching and Register Virtual Stack Slices plugins are used for this purpose. The latter has additional functionalities including elastic implementation and transformation of a composite image over a base reference image.

Image stitching. Stitching plugin helps in combining the image collected from different samples or different views into a single cohesive output.

Tracking. Tool for Automated Sporozoite Tracking (ToAST) and TrackMate are some of the plugins used in the software for the purpose of tracking. While some of these tracking plugins rely heavily on manual interaction, others can be automated to provide high-throughput analyses.

Visualisation. Graphical illustration of data enables scientists to have a better understanding and insight over data.

Boosting interdisciplinary research

The main purpose behind the development of this platform is clearly stated in the research paper titled 'Fiji: An open source platform for biological-image analysis' by Johannes Schindelin and others. Developers envision the software as a platform for productive collaboration between computer science and biology research communities.

Is the software successful in achieving its mission? Yes, says the user community around the world. "No doubt, ImageJ and Fiji are the best open source image-analysis software. These are easy and powerful," points out a user on *Researchgate*. If you are a biologist, a computer scientist or a researcher in bioinformatics working in biological-image processing, Fiji could be the ideal tool for you. ●

The author is an electronics enthusiast from Kerala

eSim for Circuit Design, Simulation, Analysis and PCB Design

JAI SACHITH PAUL

In this article we take a look at eSim, a powerful open source software for integrated electronic design applications including circuit design, simulation, analysis and PCB design. The software is built with the help of popular open source software such as Ngspice, KiCad, Scilab and Python.

It is developed as an open source alternative to commercial software like OrCAD, Xpedition and HSPICE. Educational institutions and small and medium enterprises can effectively use this software that offers the user experience and capabilities equivalent to proprietary ones.

An all-in-one EDA package

There are a series of steps involved in electronic design automation (EDA). In the first step, specifications are laid down. These specifications take the shape of a design that could be in various forms such as a schematic circuit or a logical description in a High-level Description Language (HDL). The design is then simulated and redesigned, if necessary.

Once specifications are met, the design is converted into a PCB layout, a chip layout or ported to a field programmable gate array (FPGA). The product thus obtained is again checked to see if it meets the specifications and, for that, the entire cycle is repeated till desired results are obtained.

A large number of proprietary EDA tools including Cadence, Synopsys, Mentor Graphics and Xilinx can perform all these jobs in a comprehensive fashion. Unfortunately, the cost associated with the purchase of such proprietary design tools discourages the student community from colleges as well as SMEs from playing around with such tools.

eSim, previously known as Oscad or FreeEDA, took its shape in IIT Bombay under free and open source software in science and engineering education (FOSSEE) group, making the software a viable alternative to open source ones.

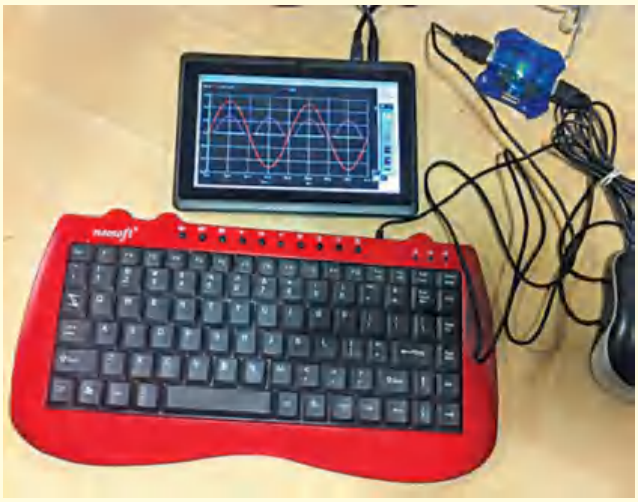


Fig. 1: eSim software running on Aakash tablet (Image courtesy: www.aakashlabs.org/gnu)

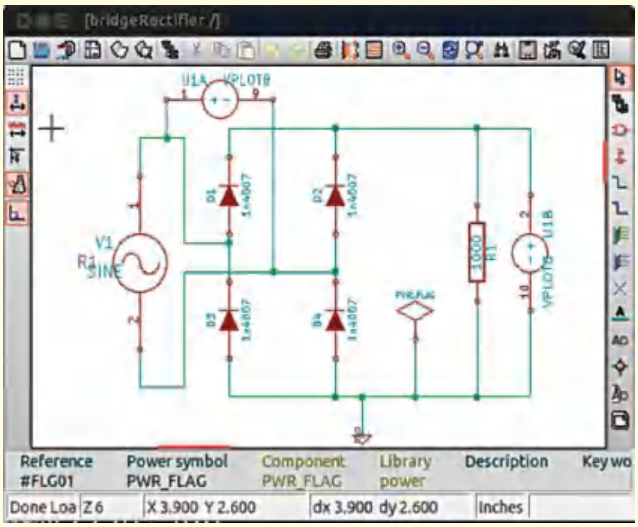


Fig. 2: Simulating a rectifier circuit using eSim

Advanced features

Rakhi R. and Kannan M. Moudgalya in their article titled, 'Oscad: Open Source Computer Aided Design Tool' discuss the advanced features of this tool. Let us take a quick glance at these.

Model Builder. How well the devices in the simulations are modelled is a prime determinant factor of the accuracy of the simulation. A set of device models including bipolar junction diodes, bipolar junction transistors (BJTs) and field effect transistors (FETs) are provided.

Suppose we are dealing with a bridge rectifier circuit. Parameters in the device model (say, the diode) can be set using the model builder tool and can even be reused by exporting the design into other files.

Subcircuit Builder. A complex circuit can be broken into simpler sub-circuits and could be reused in other projects. This ensures scalability and modularity of the design.

Running eSim on Aakash tablets

Aakash tablets were introduced into the Indian market as an affordable platform for learning and education. Porting eSim into Aakash gives access to powerful CAD systems at a cost less than US$ 40, thereby inspiring budding engineering minds who cannot afford costly hardware and software with brilliant ideas.

Software at a Glance

Name: eSim (previously known as Oscad/FreeEDA)
Type: EDA tool
Developers: Actively developed by FOSSEE group at IIT Bombay
Licence type: GNU general public licence
Key features:
- Draw circuits using KiCad, create a netlist and simulate using Ngspice
- Kicad for PCB design and Gerber files generation
- Model builder, Subcircuit Builder and SMCsim tools

Supporting platforms: Ubuntu Linux and Windows
Website: *www.esim.fossee.in*

Scilab based Mini Circuit Simulator (SMCsim). Electronic simulations are based on mathematical equations. In order to impart a clear idea of how the entire simulation actually works, it is necessary that mathematical equations are provided along with simulations. This unique feature of eSim helps users get a clear picture of simulations.

The tool runs in three modes. It solves circuit equations and gives the final simulation result in normal mode. Users can also view symbolic equations along with the result in symbolic mode. Numerical mode gives intermediate numerical values of elements and components in system matrices along with symbolic equations and the final result.

The other modules

We have already described the key features of the software. Let us now have a quick look at other important modules used in eSim software.

EEschema. This is an integrated software library where functionalities of circuit drawing, control, layout, library management and access to PCB design software are carried out. This schematic-capture software also provides the netlist describing the electrical connections of the circuit.

eSim developers have extended its functionality by incorporating software libraries for voltage and current sources.

CvPcb. This is basically a footprint editor tool that helps users to associate schematic components to component footprints in the PCB design.

Pcbnew. Pcbnew is the layout editor tool from KiCad. CvPcb tool assigns components for the netlist produced by EEschema to the module used by Pcbnew.

KiCad to Ngspice netlist converter. This module is developed by eSim developers to facilitate easy conversion of KiCad-generated netlists to Ngspice-compatible formats.

Analysis Inserter. This module helps in inserting the type and options for various kinds of analyses of electronic circuits. Various types of analysis such as operating point analysis, AC and DC analysis and transient analysis can all be done with the help of this tool developed for eSim.

Ngspice. This is yet another general-purpose circuit-simulation program for non-linear DC, non-linear transient and linear AC analyses. Simulation can contain components including resistors, capacitors, inductors, transmission lines BJTs, FETs, metal oxide semiconductor field effect transistors, etc.

eSim workflow

The circuit diagram drawn on paper is entered into a computer using EEschema, which is the schematic editor used in this software. Apart from the library that provides voltage and current sources, there is yet another one created for printing and plotting purposes. The netlist file provided by this schematic editor contains electrical connections involved in the design.

Physical components are mapped into their footprints for creation of the PCB layout. CvPcb tool is used for this footprint mapping. The PCB layout is drawn with the help of Pcbnew. It is not always practical to check the accuracy of the design using breadboard testing. Model Builder helps in creating accurate models and editing existing models. Hierarchical modelling helps in designing complex models. Subcircuit Builder helps in creating sub-circuits.

Netlst converter helps in the conversion of netlists into a Ngspice-compatible format. Analysis Inserter proves to be an effective graphical interface for various types of simulations performed.

For analogue-, digital- and mixed-signal circuit simulation, eSim uses Ngspice software. SMCsim is also provided.

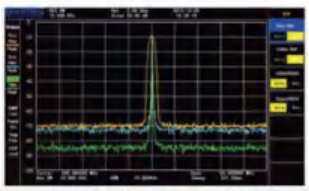
An indigenous open source software

There is a welcome trend in the country to promote the use of open source software, wherever possible. eSim was developed by the research group at IIT Bombay as a part of this initiative. The widespread use of open source software will certainly encourage a lot of people into serious research, especially in an economically-developing country like India where mastermind ideas are limited by shortage of funds. ●

The author is an electronics enthusiast from Kerala

High Performance in the most important test field

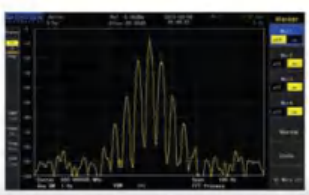
- the real world



Three simultaneous trace display at RBW 1M/100K/10K

Waterfall plot display

Adjacent channel power



Distinguish similar nearby signal at RBW 1Hz

GA40XX Series Spectrum Analyzers

GA40XX series is a small size, light weight, cost-effective portable spectrum analyzer to meet your all the RF application demands. It has easy-to-keyboard layout and high-definition 8.5-inch TFT color LCD display; display contains the appropriate settings and alerts. It includes the standard USB, LAN and RS232 communication interface, virtual terminal display and control and remote network access.

The spectrum analyzer can be widely applied in many fields of science education, enterprise research and development and industrial production.

Features

- Frequency range 9 kHz to 1.5GHz / 3GHz / 7.5GHz
- DANL: <-160 dBm(typical value)
- Phase Noise -100 dBc/Hz (Offset 10 kHz)
- Full amplitude accuracy of <1.0 dB
- Minimum resolution bandwidth (RBW) 1 Hz
- Standard preamplifier
- Tracking generator(optional)
- AM/FM demodulation measurement(optional)
- 8.5-inch (800x480) widescreen
- LAN \ USB Host \ USB Device \ RS232 or VGA

Model / Spec	GA4032 GA4032-TG	GA4062 GA4062-TG	GA4033 GA4033-TG	GA4063 GA4063-TG	GA4064 GA4064-TG
Frequency	9kHz - 1.5GHz		9kHz - 3GHz		9kHz - 7.5GHz
Aging rate	±1ppm/year	±0.1ppm/year	±0.1ppm/year		
RBW	100Hz to 1MHz, Sequence 1-3-10	1Hz to 3MHz, Sequence 1-3-10	100Hz to 1MHz, Sequence 1-3-10		1Hz to 3MHz, Sequence 1-3-10
Phase Noise	<-90dBc/Hz @10KHz	<-100dBc/Hz @10KHz	<-90dBc/Hz @10KHz	<-95dBc/Hz @10KHz	
DANL	≤-128dBm (-140dBm Typical)	≤-148dBm (-160dBm Typical)	≤-128dBm (-140dBm Typical)	≤-148dBm (-160dBm Typical)	

Other Products

Vector Network Analyzers | Function Generators | Handheld Scopes | RF Probes | Power Supplies | RF Training Kits

Building A8, 2nd Flr, Tanglang Indl Zone, Xili, Nanshan, Shenzhen, China +86 755 86021369 gratten@gratten.cn

GRATTEN | NANJING GLARUN ATTEN TECHNOLOGY CO. LTD.

www.gratten.cn

INDUSTRY NEWS

EDF to encourage electronics, IT manufacturing

J.S. Deepak, secretary, Department of Electronics and Information Technology (DeitY), while addressing the gathering at a symposium jointly organised by Canbank Venture Capital Fund and Venture Intelligence, has said that setting up of the electronics development fund (EDF) marks the fulfilment of a long-felt need.

He said that EDF will offer risk capital to industry and academia to encourage entrepreneurs to manufacture electronics locally and to reduce imports in the next five years.

He also encouraged concentrating more on designing in the electronics and IT industry in India, citing the loss of about US$ 15 billion due to intellectual property rights.

Chhattisgarh signs MoUs for electronics manufacturing

Chhattisgarh government has signed 11 memoranda of understanding (MoUs) worth ₹ 9.68 billion with 11 investors for manufacturing electronic components in the electronics manufacturing cluster (EMC) in Naya Raipur, the new state capital.

The investment intent in the electronics sector will boost IT and electronics sectors in the state and will approve state's commitment and efforts to develop the sector. Naya Raipur, the first green field capital smartcity of the country will witness the development of electronics sector in the state owing to its state-of-the art infrastructure. This will also provide opportunity for skilled youths and professionals in the state and entrepreneurs in IT and electronics sector.

Odisha plans electronics, IT hub

With the aim to invite more investments in IT and electronics sectors, Odisha government is developing a dedicated hub at Naraj, near Cuttack. To get investors, the state government has unveiled exclusive incentives for electronics system design and manufacturing investors. Investors with an investment exceeding ₹ 2 billion and offering employment potential of over 500 would be entitled to 25 per cent investment subsidy on capital investment subject to a ceiling of ₹ 500 million. Also, if their project is financed by public sector banks, the state government would offer an interest subvention of five per cent.

The state government is also developing a green-field EMC located at Harapur, Gaudakasipur and Durgapur villages of Khurda district. It is expected to house over 100 electronics manufacturing units with an employment potential of 10,000-12,000, which will be a mix of skilled and semi-skilled personnel.

Government's DeitY has awarded in-principle approval for the EMC project and approved a grant of ₹ 969.6 million for the same.

Electronics hardware would need 8.9 million workers soon

According to a report by National Skill Development Corp. (NSDC), around 8.9 million skilled workers will be required in the electronics and IT hardware sector by 2022. As per the report, electronics and IT hardware are the emerging sectors for job creation in India and employ over 4.3 million people across the country.

According to the report, India's per capita GDP has nearly tripled since 2000, rising from US$ 455 to US$ 1489 in 2012. This is further expected to rise to over US$ 2000 by 2017, and will continue to be the major source of demand in consumer electronics in the country.

Key government-initiated programmes like UIDAI project, National Knowledge Network and National Optic Fiber Network will continue to be the primary demand drivers for this sector.

India to replace all streetlights with LEDs

LED manufacturers in the country have a lot be happy about. India is expected to replace all its streetlights with LEDs in the next two years, a move that will save electricity.

Presently, India has 35 million streetlights and the electricity required to run these is a mammoth 3.4GW a year. With the switch to LEDs, this

In Focus

Sandeep Girotra to head Nokia-Alcatel India

Nokia has named Sandeep Girotra head of India as part of the planned combination of Nokia and Alcatel-Lucent, after and subject to the successful closing of the public exchange offer for Alcatel-Lucent securities.

BlackBerry appoints Narendra Nayak as India MD

Narendra Nayak has been named MD for BlackBerry's India operations. He has more than 30 years of experience in IT and telecom business management.

Two new GMs take charge at BEL

Two new GMs have assumed charge at Navratna Defence PSU Bharat Electronics Ltd (BEL). They are A. Ravisankaran, GM, Central D&E/BEL, Bengaluru, and Manoj Kumar, GM, BEL-Kotdwara.

R. Sreedharan appointed MD of Unisys India

Ravikumar Sreedharan has been appointed as MD of IT solutions company Unisys Corp. for its India unit, with effect from October 31.

Ayan Mukerji quits Wipro

Ayan Mukerji, who was heading the media and telecom business unit, has resigned from Wipro to pursue other opportunities.

Calendar of Forthcoming Electronics Fairs/Exhibitions/Seminars/Events

Name, Date and Venue	Topics	Contact address for details
Inside 3D Printing Conference and Expo December 3-4, 2015 Nehru Centre, Worli, Mumbai	Covers a range of topics including business, manufacturing, jewellery, medicine, automobile and aerospace, and provides in-depth understanding about 3D printing	Inside3DPrinting Phone: +91-9869441285 Email: info@inside3dprinting.co.in Website: www.inside3dprinting.co.in
LED Expo 2015 December 3-5, 2015 Pragati Maidan, New Delhi	Exhibition on latest LED lighting products and technologies	Messe Frankfurt Trade Fairs India Pvt Ltd Phone: 022-61445900 Website: www.theledexpo.com
Energy Storage India December 8-9, 2015 India Habitat Centre, New Delhi	International conference and exhibition on energy storage and microgrids in India	Customised Energy Solutions Website: www.esiexpo.in
WIN India December 9-11, 2015 Pragati Maidan, New Delhi	From hydraulics and pneumatics to electro-mechanical transmission, automation components to process and factory automation systems, among others	Hannover Milano Fairs India Pvt Ltd Phone: 9167522998 Email: nikhil.desai@hmf-india.com Website: www.win-india.com
7th Edition Source India Electronics Supply Chain December 16-17, 2015 Hotel Green Park, Chennai	A B2B event for suppliers and buyers from consumer electronics, home appliances, telecommunications, information technology and computers, auto electronics, industrial electronics, lighting, medical, solar and much more	Electronic Industries Association of India Website: www.sourceindia-electronics.com
CES 2016 January 6-9, 2016 Las Vegas, Nevada, USA	World's gathering place for all who thrive on the business of consumer technologies	Consumer Electronics Association (CEA) Website: www.cesweb.org
Electromation India 2016 January 7-9, 2016 Akota Stadium, Vadodara	Gujrat's first-ever focussed exhibition on automation, instrumentation, electronics and electricals	Spark Media Email: info@electromationindia.com Website: www.electromationindia.com
India Electronics Week January 11-13, 2016 Bengaluru	An Indian exhibition for the global electronics industry showcasing concurrently six events: Electronics For You Expo, Electronics Rocks, T&M India, LED Asia, Raksha India and IoT Show	EFY Enterprises Pvt Ltd Phone: +91-11-40596605 Email: growmybiz@efy.in
WEARABLE EXPO January 13-15, 2016 Tokyo Big Sight, Tokyo	Wearable device and technology expo	WEARABLE EXPO Show Management Reed Exhibitions Japan Ltd Website: www.wearable-expo.jp/en
ELECRAMA 2016 February 13-17, 2016 BIEC, Bengaluru	Serves the business needs of utilities, government, EPC consultants, contractors, electrical equipment manufacturers and generation companies	ELECRAMA 2016 Email: anil.nagrani@ieema.org
Consumer Electronics China April 20-22, 2016 Shenzhen Convention and Exhibition Center, China	Platform that unites international exhibitors with Chinese retailers keen to bring new products to their customers	CE China Website: www.b2b.ifa-berlin.com/en/Exhibitors/ApplicationCEChina2016
Industrial Automation 2016 April 25-29, 2016 Hannover Exhibition Grounds, Hannover, Germany	Manufacturers present solutions for manufacturing and process automation, robotics, image processing, efficient drive technology, pumping systems as well as solutions and applications in medical and pharmaceutical technology	Industrial Automation 2016 Website: www.hannovermesse.de/en/exhibition/trade-fair-line-up/industrial-automation/
Del Mar Electronics & Design Show May 4-5, 2016 Del Mar Fairgrounds, San Diego, California, USA	Covers electronic components, fabrication, design and other aspects of electronics manufacturing	Del Mar Trade Shows Inc. Website: www.mfgshow.com
CWST-Expo2015 June 9-11, 2016 Bombay Exhibition Centre, Mumbai	The presentation platform for coil winding, insulation, stamping, transformer manufacturers, coil winding machines and allied industry	Brandscope Exhibitions Phone: +91- 9699807207, 9899107207 Website: www.cwstexpo.com
8th Future of Wireless International Conference June 21-22, 2016 London, UK	A leading conference for discovering the latest in cutting-edge wireless technology	Cambridge Wireless Website: www.cambridgewireless.co.uk/futureofwireless
NIWeek August 1-4, 2016 Austin Convention Center, Austin Texas, USA	Annual global conference for graphical system design organised by National Instruments	National Instruments Website: www.ni.com/niweek
IFA Berlin September 2-7, 2016 Berlin ExpoCenter City, Berlin, Germany	Leading trade show for consumer electronics and home appliances	IFA Berlin Website: www.b2b.ifa-berlin.com/en/IFA/AboutIFA

Look up under 'Events' section in www.electronicsforu.com for a comprehensive list

Since this information is subject to change, all those interested are advised to ascertain the details from the organisers before making any commitment.

load is expected to come down to only 1.4GW, and the money saved will be around US$ 850 million annually. Slashing electricity consumption by over 60 per cent will go a long way in addressing India's chronic electricity deficit.

In the beginning of this year, Prime Minister Narendra Modi launched a programme called 'National Programme for LED Based Home and Street Lighting,' under which 100 cities were to be completely lit with LEDs by March 2016, and the remaining in the following three years. But the streetlight project, which covers all streetlights in the country, is now expected to be completed within the next two years.

DMRC to embrace LEDs

Delhi Metro Rail Corp. (DMRC) is planning to install LED lights in order to conserve energy in all metro stations. By doing so, DMRC is expected to save ₹ 70 million annually and the consumption of electricity will be 40 per cent lower.

The DMRC has signed an MoU with Energy Efficient Services Ltd (EESL), which will be ensuring that all stations, depots and residential complexes of DMRC use energy-efficient LED lights. DMRC has always adopted technologies that help it become greener, and this initiative is in line with its long-term environment protection drive.

Solar to account for 18 per cent of power generation in India

Solar energy in India is expected to account for 18 per cent of the total power-generation capacity by 2030 from its current usage of one per cent at present.

In its recently-submitted Intended Nationally Determined Contributions (INDC), India has devoted to achieve 40 per cent cumulative electric power installed capacity from non-fossil fuel based energy resources by the target year.

Meanwhile, wind energy generation will be at ten per cent from the current nine per cent, while nuclear

Snippets

India eyes six per cent share in the IoT industry

According to J.S. Deepak, secretary, DeitY, government of India, India is eyeing a share of five to six per cent in the US$ 300 billion global Internet of Things (IoT) industry in the next five years. It aims to create US$ 15 billion domestic industry by 2020.

Renesas Electronics India wins leadership award

Renesas Electronics India Pvt Ltd has received Frost & Sullivan 2015 India Microcontrollers Competitive Strategy Leadership Award for its exemplary achievements in strategy, processes and vision on October 7, 2015, at Growth, Innovation and Leadership Awards Gala held in Mumbai.

HCL acquires Concept to Silicon Systems

HCL Technologies has acquired a Bengaluru based engineering services firm, Concept to Silicon Systems (C2SiS). With this strategic acquisition, HCL will be able to leverage C2SiS' technical prowess in areas such as system on chip and physical design, among others, and will extend its leadership position in the semiconductor industry.

Infosys to develop apps on IBM's Bluemix cloud platform

Software major Infosys would use the cloud platform (Bluemix) of global IT firm IBM to develop and deploy next-generation applications for its enterprise clients worldwide. Staffed with designers, specialists and industry and technology architects, the lab is designed to deliver application prototypes.

Digi-Key to celebrate milestone of 50 million shipped packages

Global electronic components distributor Digi-Key Electronics will soon be shipping its 50-millionth package in the history of the company. Customers can watch the counter on its homepage in anticipation of the 50,000,000 mark, which is expected to occur within the next few weeks.

power would remain at two per cent without any change. However, generation of hydro-electric power will dip from 17 per cent to nine per cent. Coal power usage will be reduced to 57 per cent from 61 per cent for the electricity generation today.

VPT to invest ₹ 600 million on solar project

Visakhapatnam Port Trust (VPT) will invest ₹ 600 million to generate 10MW solar power by 2016. The port has given a nod to Noida based Jakson Engineers Ltd to commission the project. Jakson Engineers will establish solar panels in two phases by January 15, 2016 and by March 20, 2016. The company has also been entrusted with the AMC for seven years.

Meanwhile, Andhra Pradesh Eastern Power Distribution Co. Ltd will assist VPT in synchronising with the state power grid.

Solar panels will be set up over 202,343sqm (50 acres) of port land near the runway, which has been identified by the officials of Solar Energy Corp. of India.

SoftBank enters Indian solar market

Japan based SoftBank has forayed into the Indian solar market with its first bid for a 500MW solar park project in Andhra Pradesh. This is the first bid by SoftBank for any power project through its joint venture, SBG Cleantech.

Bids were called under Jawaharlal Nehru National Solar Mission for a solar power project in Andhra Pradesh for which SoftBank joint-venture company has bid for 500MW at an estimated tariff of ₹ 5.6/MW to ₹ 5.75/MW. Around thirty bidders participated in the auction and SBG Cleantech was one of the companies qualified to submit its final bid.

Earlier this year, the bank had joined hands with Foxconn and Bharti Enterprises to invest in the Indian solar sector.

Toshiba to sell sensor business to Sony

Toshiba Corp. will sell its image sensor business to Sony Corp. for approximately yen 20 billion (US$ 164.68 million) as part of a restructuring plan laid out earlier this year. Toshiba, whose businesses range from laptops to nuclear power, is undergoing a restructuring after revelations that it overstated earnings by US$ 1.3 billion going back to fiscal 2008-09.

Image sensors, which are used in digital cameras and smartphones, are part of Toshiba's system LSI semiconductor business. The company plans to sell its image sensor manufacturing plant in Oita, southern Japan, and pull out of the sensor business altogether.

According to Masashi Muromachi, CEO, Toshiba, the deal for the image sensor business would be the beginning of the restructuring.

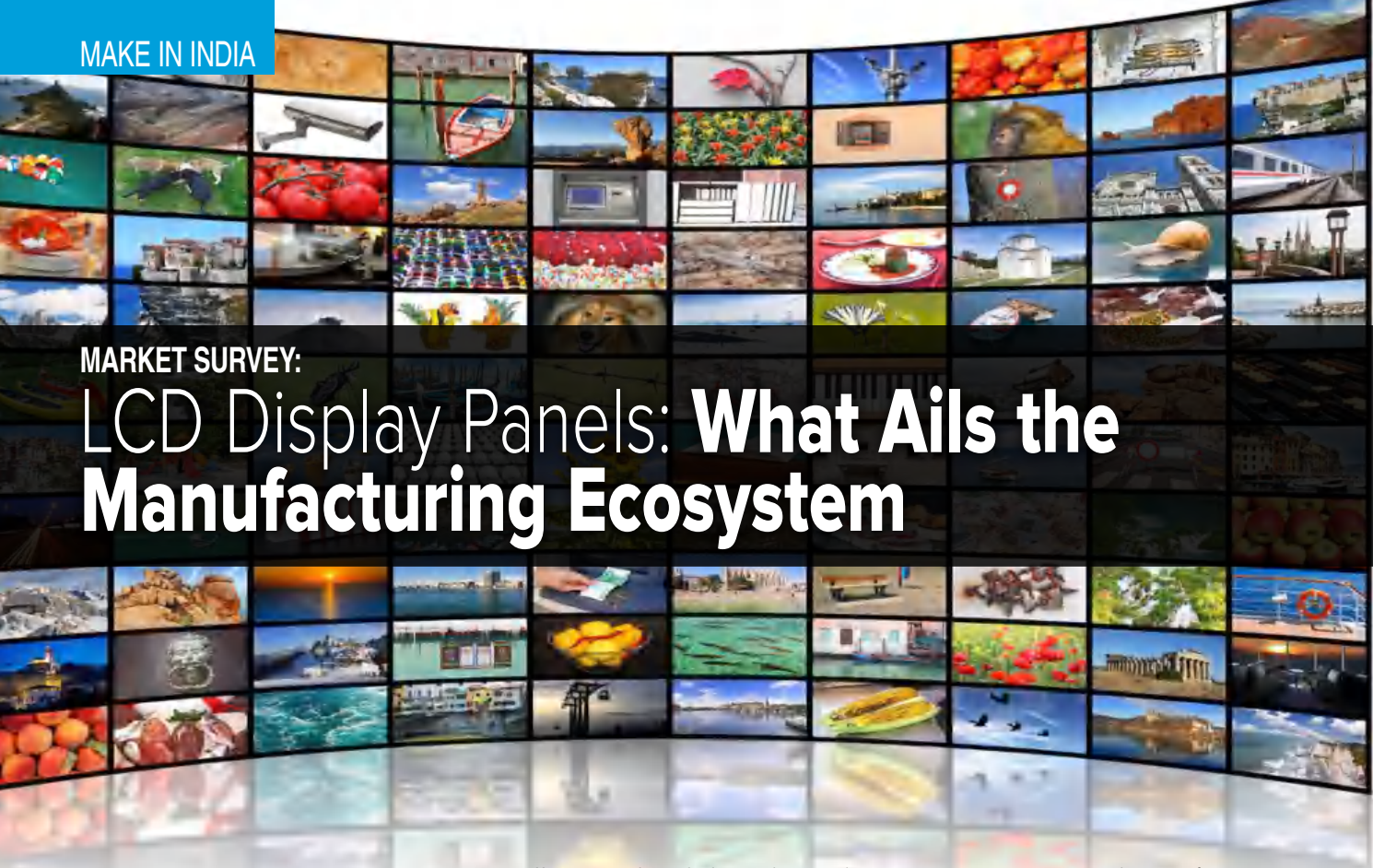
Sony is already a dominant player in the image sensor market, with its products used in phones made by China's Xiaomi and India's Micromax Informatix Ltd.

Pepsi to enter smartphones market

In the next few months, PepsiCo Inc. may enter the smartphones market as the company is working with a licensing partner to market a line of mobile phones and accessories in China. However, as per reports, the food and beverage company has no plans to get into the mobile phone manufacturing business.

On October 11, technology website www.mobipicker.com was the first to report that PepsiCo was planning to release a smartphone called Pepsi P1. It is expected to be a mid-level phone without high-end specifications. It is pertinent to mention here that PepsiCo already has many licensees across a number of categories. Last year, it tied up with companies such as Danish luxury stereo and TV maker Bang & Olufsen. It has also tied up with Italian shoemaker Del Toro for a range of products for its football campaign.

Check efytimes.com for more news, daily



MARKET SURVEY:

LCD Display Panels: What Ails the Manufacturing Ecosystem

Mrinmoy Dey was working as a senior correspondent at EFY until recently

A Frost & Sullivan study titled 'Analysis of the Indian LCD Panel Market,' published in 2009, highlighted the increasing demand for LCD panels for domestic consumption and conceded that, keeping a wide scope of application and high local demand in perspective, the time is ideal for LCD panel manufacturing in India. The report noted, "Local demand, export prospects, government initiatives, wide applications and low setup costs during the economic decline favour LCD panel manufacturers, making it an ideal time for LCD panel manufacturing in India."

Six years have passed and many factors that were favourable during that period have only progressed on to the positive side. For example, local demand has gone up manifold, thanks to the increasing demand from the consumer electronics sector as well as increased manufacturing activities. Applications have only increased over time. And now, the government is actively promoting domestic manufacturing through its Make in India initiative. This comes at a time when production costs are going up worldwide.

So the scope of manufacturing has become even more favourable. Also, announcement from Sterilite Technologies, a part of Anil Agarwal-led Vedanta Group, about setting up LCD panel manufacturing units with an investment of ₹ 400 billion is an indication of the same. However, overall at industry level, there is very little value addition that is being done in India. LCD panel manufacturing has not picked up as one would have expected.

But, can this trend be buckled down? With the rising cost of production in China and strengthening of yuan against the US dollar, investors are looking at alternate manufacturing destinations. Will China's pain turn out to be India's gain? And, what could be the panacea of the ills that bedevils the state of LCD panel manufacturing in India? This EFY report tries to seek answers to all these questions.

The rising local demand

Before delving deep into problems and looking for solutions, let us first understand the positives or what ticks. Local demand has increased manifold. Demand for LCD panels primarily stems from the following sectors:

- Televisions
- Monitors
- Mobiles, tablets and digital cameras
- ATMs and point-of-sale devices
- Industrial automation

As per a 2014 joint report on ESDM sector by IESA and Frost & Sullivan, the flat-panel

display TV (FPDTV) market in India was valued at US$ 3.55 billion in 2012 and was likely to grow at a compound annual growth rate (CAGR) of 23.7 per cent till 2015. Total market for FPDTVs in India in 2012 was 6.48 million units and total domestic manufacturing volumes was 1.93 million units for the same year.

The report also noted, "The LCD monitors market was estimated to have been worth US$ 907 million in 2012 and was projected to grow at about 11.2 per cent during the period 2011-2015." The report further conceded that LCD technology has nearly replaced cathode ray tube technology and dominates the display segment presently.

On the other front, the mobile handsets market, particularly the smartphone segment, is growing rapidly. According to a FICCI-EY report titled 'Speeding ahead on the telecom and digital economy highway,' domestic market for mobile handsets is expected to cross 300 million devices in 2015. However, the report estimated locally-manufactured devices to be only 46 million. This will also increase with recent government initiatives as domestic manufacturing is increasing. Case in point, Lava is setting up a plant in Greater Noida.

Other markets like industrial automation are also expected to grow as manufacturing activities pick up. According to a TechSci Research report titled 'India Factory Automation Market Forecast & Opportunities, 2020,' the factory automation market in India is projected to witness a CAGR of around 12 per cent during 2015-2020.

Nilesh Dedhia of Lappteck Marketing opines, "The LCD panel industry in India is growing at a fast pace and we expect steady growth of the same. As government's Make in India is gaining momentum, electronics industry seems to be at the takeoff stage. With India aiming to be the manufacturing hub for LCD TVs, mobile phones, defence and medical electronics, prospects of the LCD industry look good. The only challenge will be sourcing good-quality components at competitive prices and tax structure on the same."

The local advantage

This burgeoning demand is supposed to aid local manufacturing of LCD panels. The Frost & Sullivan report pointed out that local manufacturers can address the demand through optimal pricing and establish a reactive supply chain. The report noted, "Quality products at a low price, good supply chain and brand equity are some of the key strategic factors in the LCD panel market in India." It further argued, "To have an edge over competitors, it is critical for LCD panel manufacturers to provide extremely competitive prices, immediate availability and effective customer support."

What is holding it back

However, despite all these factors, there is very little manufacturing activity going on. Though buyers are increasingly demanding LCD display systems, there is not enough local production, and majority is catered to through imports. So what is lacking?

The joint IESA-Frost & Sullivan report noted, "In the case of LCD displays, India possesses local design and manufacturing capabilities for some end-use products. However, the cost of production of panels and its technology-intensive nature have kept India void of an LCD display assembling/manufacturing unit hitherto."

D. Malakar, managing director, Deepakshi Display Devices, in an interaction with *Electronics Bazaar* in 2011, said, "Manufacturing LCD modules is a tough and expensive affair in India. Components like LCD glass panels, gold-plated printed circuit boards and integrated circuits required for manufacturing LCD displays are not available locally. Thus, we are forced to import components and assemble these into LCD displays to meet consumer demand."

He further went on to add that, manufacturing of LCD modules is also not a profitable business in

LCD display ecosystem assessment

Strengths	*Challenges*	*Recommendations*
➤ Huge consumption demand	➤ Ecosystem does not prevail	➤ Relocation of a brownfield Gen 5 fab
➤ End use product manufacturing through OEMs and EMSes exists	➤ Inverted duty structure	➤ Preferential excise duty for panel manufacturing; tax rebates
➤ Favourable incentives for panel manufacturing available under MSIPS	➤ Debilitating FTAs with Thailand, Japan, etc	➤ Hike in import duty of finished display imports
	➤ Infrastructural challenges	➤ Fund to encourage local technology development

Source: IESA-Frost & Sullivan

Major contributors to this report

- Arindam Bhattacharya, senior partner and director, Bruce Henderson Institute, Boston Consulting Group
- D. Malakar, managing director, Deepakshi Display Devices
- Jayan Namboodiri, proprietor, Royal Display
- Nilesh Dedhia, Lappteck Marketing

India. There are issues like delayed payment cycles, maintenance of machines and overheads. "There is lack of support in terms of infrastructure, administrative policies, good R&D and a lot more," Malakar added.

Malakar's insights remain relevant even today. Echoing a similar thought, Jayan Namboodiri, proprietor, Royal Display, adds, "LCD panels manufacturing will not be a successful business in India as the ecosystem is not present. Most of the raw materials need to be imported. In terms of growth, we feel the demand at the industrial level has grown by a mere five per cent and we are not expecting much competition in near future, even after panel manufacturing starts in India."

He further highlighted that small-scale players who ventured into LCD modules manufacturing in India have either closed down or shifted their focus."Presence of low-cost Chinese displays makes it really hard for Indian manufacturers to compete with the import duty in its current form," adds Namboodiri.

Dedhia says, "We do not have any plans to set up any plant in India although we have had a few offers. We will wait and watch." However, he is positive about the development of the industry in view of recent government initiatives.

Other challenges include the existing duty structure that makes importing a cheaper option for displays. Namboodiri opines, "Domestic manufacturing can grow only if raw material duty is brought down to zero and government gives some tax relief for this segment."

The way ahead

Given the high-volume demand anticipated in the various products that consume displays, it becomes pertinent to grow the ecosystem for LCD displays locally. So what could be the way out or, to put it in another way, is there a way out?

In a column in *Financial Express* titled 'Making Make in India happen,' Arindam Bhattacharya, senior partner and director, Bruce Henderson Institute, Boston Consulting Group, opines that, to attract global investments in some investment-intensive sectors like those in the high-end of electronics value chain, India must offer a package of incentives. The column noted, "Investment in investment-intensive high-end of the electronics value-chain is very lumpy and made for a decade of future demand or longer, given the high-investment intensity. And thus, these follow a cycle of large investment, which takes a long time to pay off as demand slowly catches up, and rates can vary from country to country." Therefore it is important to approach these large anchor client investors with specifically-designed incentive packages, which are based on an in-depth understanding of the economics of the investment and the investment cycle of the firm."

Other than this, it is important to give domestic manufacturers some sort of protection, either in terms of market assurance (like it is being done in the case of LED lighting products through preferential market access policy) or in terms of trade barriers making importing a costlier affair. However, with very little manufacturing activities taking place, imposing a high import duty will be counterproductive for other industries using LCD panels as components in absence of local supply.

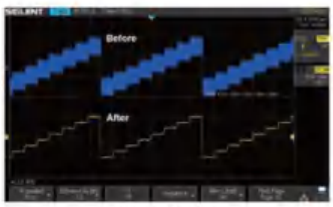
Also, India being a key member of World Trade Organisation, and having already signed FTAs with many countries, it will be difficult to impose high enough tariffs that will force fab manufacturers to set up plants in India if they want to cater to the market. But with India trying to increase manufacturing activity in the monitors, TVs and mobile phones market, this seems unlikely. It poses a Catch 22 problem.

So India might take the middle path of increasing assembling activities and gradually increasing value-addition. Moreover, indigenous LCD panel manufacturers are expected to face the challenge of competing against some of the established global manufacturers. However, a local presence would give others a competitive edge in many fronts. Towards increasing domestic manufacturing, announcement from Sterilite is a welcome move. ●

NEW!

Waveform capture rate up to 500,000 wfm/s (sequence mode)

Record Length up to 140 Mpts

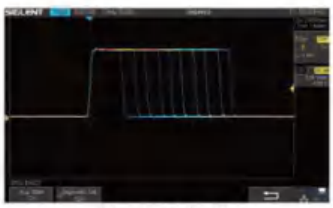


Eres Mode

INNOVATIVE DESIGN, POWERFUL PERFORMANCE

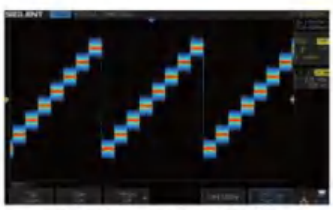
SDS2000X Super Phosphor Oscilloscope coming.....

- 8 Inch TFT-LCD display
- New generation of SPO technology
- Waveform capture rate up to 140,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
- Record length up to 140 Mpts
- 37 Automatic measurement parameters
- 16 Digital channels (MSO - option)
- Intelligent trigger: Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern and Video
- 10 Types of one-button shortcuts



Sequence Mode

Model	SDS2072X SDS2074X	SDS2102X SDS2104X	SDS2202X SDS2204X	SDS2302X SDS2304X
Bandwidth	70 MHZ	100 MHZ	200 MHZ	300 MHZ
Real-time Sampling Rate	2G Sa/s			
Memory Depth	140 Mpts			
Trigger Type	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video			
16 Digital Channels (MSO Option)	Maximum waveform capture rate up to 500 MSa/s, Record length up to 140 Mpts/CH			
Waveform Generator (Optional)	Single channel, Max. frequency up to 25 MHz, 125 MSa/s sampling rate, 16 Kpts wave length			
I/O	USB Host, USB Device, LAN, Pass/Fail, Trigger Out, GPIB (Optional)			



Color Temperature Display

Serial Bus Decoding

SIGLENT TECHNOLOGIES CO., LTD.
Add: Blog No.4 & No.5, Antongda Industrial Zone, 3rd Liuxian Road, Bao'an District, Shenzhen, 518101, China.
Tel: + 86 755 3661 5186; Email: sales@siglent.com; Website:http://www.siglent.com/ens/.

SIGLENT®

NEW PRODUCTS

COMPONENTS

Universal input micro PLC

Industrial automation engineers can now achieve highly-accurate measurements for their system designs with MAXREFDES67# analogue front-end universal input micro PLC reference design from Maxim Integrated Products. Key advantages of the product are:

Effective resolution up to 22.3 bits with temperature error as low as ±0.1 per cent across a range of -40°C to 150°C

Beyond-the-rails signal chain reduces board space, component count and cost

Universal input accepts four different signals, namely, voltage, current, resistance temperature detector and thermocouple

Maxim Integrated Products Inc.
Website: www.maximintegrated.com

FRAM MCU

Texas Instruments has announced MSP430 ferroelectric random access memory (FRAM) microcontroller (MCU) with CapTIvate technology. The new MCU offers comprehensive hardware and software features for a reliable performance in noise-challenged applications including electronic access controls, appliances, personal electronics, industrial control panels and more.

It enables designers of all skill levels to build robust human-machine interfaces with capacitive buttons, sliders, wheels or proximity sensors. It also enables multi-touch designs with plastic, glass and metal overlays of various thicknesses.

Texas Instruments
Website: www.ti.com

Wi-Fi module

ESP-WROOM-02 is a 32-bit low-power MCU Wi-Fi module that integrates TCP/IP network stacks and includes 10-bit analogue-to-digital converter

with HSPI, SDIO, UART, PWM, I2C and I2S interfaces. It can be easily integrated into resource-limited devices due to its small form factor of only 18mm x 20mm.

In addition to ESP8266EX chipset, the module also integrates an SPI flash with 32Mbits capacity in SOP8-150mil. The SPI flash is incredibly useful for storing user programs and firmware. ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor.

Uchi Embedded Solutions
Website: www.uchiembedded.co.in

Transceiver IC

ROHM has announced a transceiver integrated circuit (IC) compatible with the new low-speed, low-cost CXPI communication protocol for use in body control applications, including steering switch, AC and instrument panel systems.

BD41000FJ-C enables multiplexing between ECUs, contributing to decreased vehicle weight and improved fuel efficiency by reducing the number and size of wiring harnesses.

In addition, low quiescent current (3µA typ.) and high ESD resistance (±8kV, IEC61000-4-2) make it possible to achieve low-power, high-reliability CXPI communication.

ROHM Co. Ltd
Website: www.rohm.com

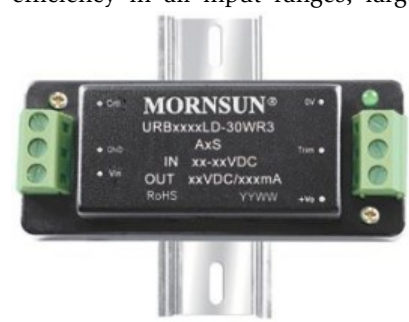
Insulated-gate bipolar transistor

Renesas Electronics has announced the new RJP65T54DPM-E0, a power semiconductor device for use in air-conditioner power factor correction circuits that employ partial switching, which are widely used in mid- to low-end air-conditioners.

Renesas Electronics Corp.
Website: www.renesas.com

DC/DC converter

The R3 DC/DC converter features ultra-low standby consumption, high efficiency in all input ranges, large



capacitive loads and multiple protections (input under-voltage protection, output over-voltage protection, over-current protection and short-circuit protection) that allows it to be used in most applications.

The average efficiency of R3 reaches 80 per cent at 10 per cent to 100 per cent load. Even if the load is lower than ten per cent, light-load efficiency of R3 exceeds 78 per cent and standby power consumption is low to 0.12W, which solves the temperature-rise problem perfectly when operating in light-load conditions for a long time and enhances reliability. In addition, these offer 4:1 wide input voltage range, 1500V DC/3000V

DC isolation voltage and an operating temperature of -40°C to +85°C.

Mornsun Guangzhou Science & Technology Co. Ltd

Website: www.mornsun-power.com

TEST & MEASUREMENT

Clamp meter

The EX850 TRMS 1000A AC/DC clamp meter for Android has the following key features:

- Integrated Bluetooth connects with most Android devices to transmit readings for remote viewing
- Works with Android app to display large, easy-to-read values for AC/DC voltage, AC/DC current, capacitance, resistance, frequency, diode test and temperature [(type K and infrared (IR)], up to 10m away
- Non-contact IR thermometer design with laser pointer
- CAT IV safety rating for industrial applications
- True RMS current and voltage measurements
- Peak hold captures inrush currents and transients
- 43mm jaw opening for conductors up to 750MCM or two 500MCM
- 4000-count backlit display
- Auto-ranging with manual range button
- Data Hold, Min/Max and Auto Power Off functions

FLIR Systems India Pvt Ltd

Website: www.flir.com

Selective level meter

The SLM3505 is designed to provide a single-instrument solution for the electric utility system protection engineer and relay/communications technician

responsible for the alignment and maintenance of power-line carrier, audio tone and FSK communication systems.

Key functions of the meter are:

- Single and dual frequency selective level meter
- Impedance analyser (LCR measurements)
- Frequency-response analyser
- VSWR meter
- Signal generator
- Oscilloscope

Aplab Ltd

Website: www.aplab.com

Solar power meter

MECO solar power meter is used for measuring solar power or solar irradiance. It uses high-sensitivity silicon

photodiode to measure solar power. The solar meter can also detect the solar tilt angle with orientation.

This instrument is designed to measure solar power in the range of 400 nanometres to 1100 nanometres and solar power and transmission up to 2000W/m^2. It has Max/Min/Avg and Data Hold functions to identify locations with maximum or minimum power. The good spectral range, orientation and angular detection of the meter allow users to conduct precise quantitative measurements of solar power radiation.

MECO Instruments Pvt Ltd

Website: www.mecoinst.com

Waveguide mixer

The newly-released MA2808A along with MS2830A in the 26.5GHz/43GHz configuration (MS2830A-044/045) supports development and production of equipment

for both E-band (70GHz/80GHz) wireless backhaul as well as automobile collision avoidance radar (77GHz/79GHz).

MA2808A combines excellent minimum sensitivity performance with a wide measurement span in an easy-to-use configuration to support millimetre-wave measurements.

Anritsu India Pvt Ltd

Website: www.anritsu.com

LEDs

LED fittings

This product is complete for fixing and connection to 230V AC, 122cm (4-feet) fitting, provided with two mounting brackets on both ends that can be used to mount the fitting on any flat surface.

The angle of the tube can be adjusted and locked on the bracket, allowing the light to be directed downwards in case of wall mounting. This allows for greater flexibility in use. The fittings are available in the following models:

Binay Quadralume. 12ES (extra-saving ultra-high efficiency), power consumption 12W, replaces 1x36W fluorescent tube

Binay Quadralume. 16ES (standard efficiency), power consumption 16W, replaces 1x36W fluorescent tube

Binay Quadralume. 24 DUO, power consumption 25W-28W, replaces 2x36W fluorescent tube

Binay Quadralume. 24x2 QUADRO double type, power consumption 50W-56W, replaces 4x36W fluorescent tube

Binay Opto Electronics Pvt Ltd

Website: www.binayLED.com

Power LEDs

Kwality's PolyWa 3535W, 3030W, 3433W, 331W and 2835W series of power LEDs are embedded with a single large chip from high-reliability LED chip capable of being driven up to 150mA/350mA/700mA to obtain 130 lumens to 280 lumens. These are ideal for retrofit applications, replacing existing incandescent and fluorescent bulbs.

Kwality Photonics Pvt Ltd
Website: www.kwalityphotonics.com

Rechargeable LED flood lights

Pyrotech offers a complete range of energy-saving LED rechargeable/portable flood lights with optimum thermal management and highly-efficient constant-current driver having short-circuit and open-circuit protection in die-cast aluminium housing. With these lights you can save up to 60 per cent power. The power factor is > 0.9.

The salient features are:

- Battery operated
- AC/DC adaptor
- On/off switch with dimmer
- LED indicator
- 4-5 hours of battery usage

Pyrotech Electronics Pvt Ltd
Website: www.pyrotechlighting.com

INTERNET OF THINGS

Development board

DragonBoard 410c, a low-cost development board built by Arrow Electronics, is based on Qualcomm Snapdragon 410 processor. It is

ready to work with Microsoft Azure Internet of Things (IoT) Suite. It offers a quad-core ARM Cortex A53, advanced processing power, WLAN, Bluetooth and GPS—all packed into a development board, which is the size of a credit card.

It is ideal for a wide variety of applications including prototyping, next-generation robotics, medical devices, building automation, digital signage and gaming consoles.

Arrow Electronics
Website: www.arrow.com

Smartbulbs

Cube26 has launched its first smart-device in the IoT category—IOTA Lite. The smartbulb is powered by

Texas Instruments microprocessor and uses energy-efficient Toshiba LEDs. With a lifespan of 15,000 hours, IOTA Lite offers users the choice of 16 million colours to play with. It is compatible with devices running on Android version 4.0+ and 5+.

IOTA Lite is rated at 7W and offers 500 lumens of brightness. Powered by Bluetooth 4.0, it connects into an existing light fixture without the need for a hub or extra hardware. An intuitive and seamless system, IOTA Lite's firmware is upgradeable and future-proof.

Cube26
Website: www.cube26.com

BLE solutions

Microchip Technology has announced its next-generation Bluetooth Low Energy (BLE) solutions. Qualified to

Bluetooth 4.2 standard, IS1870 and IS1871 Bluetooth LE RF ICs, along with BM70 module, expand Microchip's existing Bluetooth portfolio and carry both worldwide regulatory and Bluetooth Special Interest Group certifications.

These are ideal for the IoT and Bluetooth Beacon applications, and make it easy for designers to take advantage of the low power consumption and simplicity of BLE connectivity.

Microchip Technology Inc.
Website: www.microchip.com

Wireless module

Amp'ed RF Wireless Technology, an international provider of IoT modules and wireless solutions, announces the availability of WB51. WB51 tri-mode combines Wi-Fi, BLE and Bluetooth classic into an all-in-one module. It is optimally designed for the IoT and machine-to-machine industry segments such as point of sale, medical, transportation, fitness and many other application areas.

Harihi Ohm Electronics
Phone: 09246330299
Email: info@harihiohm.in

An EFY GROUP EVENT

India's first mega event for all the stake-holders of Internet of Things ecosystem to come together.

iotshow.in

January 11th-13th, 2016

Bangalore International Exhibition Centre, Bengaluru

To increase your sales by exhibiting in this event, Call: **Jyotsna (011-40596605)** or write to us at: **efyexpo@efy.in**

Co-located at INDIA ELECTRONICS WEEK

January 11th-13th, 2016
Bengaluru

Joystick Based Stepper Motor Angle Controller **Using AVR MCU**

ASHUTOSH M. BHATT

A stepper motor is associated with parameters like speed, direction, number of revolutions and angle of rotation. There are different types of stepper motor controllers designed to control required parameters as per specific applications. Here is a project for controlling a stepper motor's angle of rotation up to 360°.

Controlling the angle of rotations of stepper motors finds many applications including the following:

Satellite dish antenna positioning. A satellite dish antenna should be in alignment with the satellite in space to receive signal at maximum strength. Therefore it is important to position the dish antenna at required angle.

Aileron, elevator and rudder positioning in aircraft. In aircraft, it is required to position the aileron, elevator and rudder at desired angles to increase or decrease lift, change direction and increase or decrease speed.

Rudder positioning on ship. To move the ship in a specific direction, it is important to set the angle of the rudder located in front of the propeller.

Tank guns or howitzers positioning. For hitting the bulls-eye (target), the tank gun (or howitzer) must be positioned at a specific angle.

One way to control the stepper motor's angle of rotation is by using a joystick. You can turn the joystick shaft at a specific angle to rotate the motor at the desired angle and, at the same time, setting of the angle of rotation can be displayed on the LCD screen.

As the joystick shaft is turned right or left, the motor immediately follows the joystick and rotates in the same direction by same angle. That is, if the shaft is turned counter-clock-wise, the motor also rotates in that direction through a similar angle, and vice versa.

Circuit and working

Circuit of the joystick based stepper motor angle controller using an AVR microcontroller (MCU) is shown in Fig. 1. It is built around AVR MCU ATMega16 (IC4), current driver chip ULN2003 (IC3), a 16x2 LCD module (LCD1) and a few other components.

In this project we use a 10-kilo-ohm joystick potmeter (JP1), which varies the voltage given as input to the built-in analogue-to-digital (ADC) converter of the MCU. The MCU, through the program, rotates the stepper motor at a desired angle as per the position of the joystick shaft.

JP1 is connected as input to the first channel of the built-in ADC at pin PA0. It is connected in such a way that when its shaft is rotated fully, voltage at PA0 increases from 0V to 5V.

PORTB pins PB0 through PB3 are connected to input pins of IC3. These pins drive stepper motor M1. Output of IC3 drives four coils of the unipolar stepper motor. The common terminal (point E) of motor coils and common pin 9 of IC3 are connected to + 5V.

PORTD of IC4 drives eight data pins

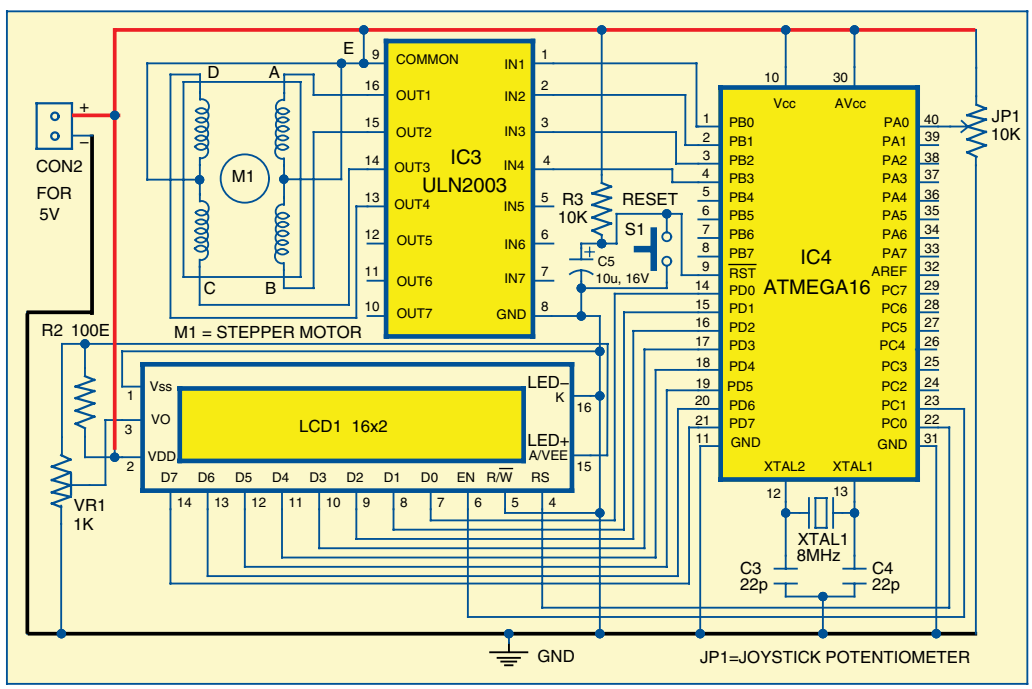


Fig. 1: Circuit diagram of the joystick based stepper motor angle controller using an AVR MCU

(D0 through D7) of LCD1. PORTC pins PC0 and PC1 of IC4 drive two control pins RS and EN of LCD1, respectively. Control pin R/$\overline{W}$ of LCD1 is connected to ground. A 1-kilo-ohm preset is connected to pin 3 of LCD1 to control the contrast of the display.

An 8MHz crystal is connected to crystal input pins of ATMega16 along with two ceramic capacitors forming the clock circuitry. Complete circuit operation is due to the software program embedded into the AVR MCU.

Power supply. The circuit requires 5V DC regulated voltage. The power supply circuit is shown in Fig. 2. 5V DC is derived from 230V AC mains through a transformer (X1), bridge rectifier DB107 (IC1), 7805 regulator (IC2) and a few other components. Glowing of LED1 indicates the presence of power in the circuit.

Software

The software program is written in C language. It is compiled using AVR Studio software.

Software logic. Software logic is to find two things: setting the angle of the motor rotation as per position of joystick shaft and positioning the stepper motor in predefined start angle at power on.

As the potmeter is rotated, analogue voltage input to the ADC pin is varied and so the corresponding digital input also varies. As analogue input varies from 0V to 5V, digital input varies from 0 to 1023 (because ATMega16 has 10-bit ADC resolution). This complete range of 0 to 1023 is divided into 12 different ranges such as 0-85, 86-171, 172-257 and so on. The motor angle is set as per the digital value listed in the table.

Motor rotation directly depends on its step resolution. Motor step resolution is 3.75°/pulse. That means, for each pulse applied, motor rotates by 3.75° only. But it is required to give four pulses in a sequence to all four motor coils. So the motor will rotate by 3.75° × 4 = 15°. Thus, we can rotate the motor in multiples of 15° such as 15°, 30°, 45°, 60°, 75° and so on.

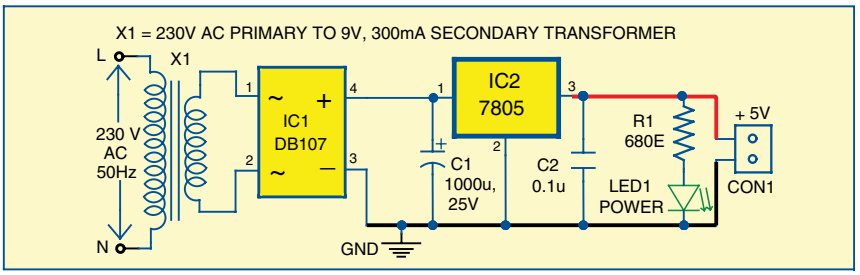


Fig. 2: Circuit of the power supply

PARTS LIST

Semiconductors:
IC1 - DB107 bridge rectifier
IC2 - 7805, 5V regulator
IC3 - ULN2003 driver
IC4 - ATmega16 MCU
LED1 - 5mm LED
LCD1 - 16×2 alphanumeric display module

Resistors (all 1/4-watt, ±5% carbon):
R1 - 680-ohm
R2 - 100-ohm
R3 - 10-kilo-ohm
VR1 - 1-kilo-ohm preset
JP1 - 10-kilo-ohm joystick potmeter

Capacitors:
C1 - 1000□F, 25V electrolytic
C2 - 0.1□F ceramic
C3, C4 - 22pF ceramic
C5 - 10□F, 16V electrolytic

Miscellaneous:
X1 - 230V AC primary to 9V, 300mA secondary transformer
XTAL1 - 8MHz crystal oscillator
M1 - 3.75°/step, 5V stepper motor (unipolar)
CON1 - 2-pin berg strip male connector
CON2 - 2-pin terminal connector
CON3 - 5-pin berg strip male connector
- 16-pin berg strip female connector for LCD1
S1 - Tactile switch

The logic is to find out the number of pulses that should be applied to the motor so it can rotate till the desired angle value is achieved. To do this, every time you select a rotation angle, the number of pulses to be applied to the motor is found using the relationship given below:

Number of pulses = 4 × (new set angle value – previous set angle value)/15

For example, let us say, the previously set angle value was 45° and the new set angle value is 75°. That means, the motor has to rotate for 30°. Putting values in the above equation,

Different Angles of Stepper Motor Rotation

Serial number	Range of digital values	Corresponding angles (in degree)
1	0-85	0
2	86-171	30
3	172-257	60
4	258-343	90
5	344-429	120
6	430-515	150
7	516-601	180
8	602-687	210
9	688-773	240
10	774-859	270
11	860-945	300
12	946-1023	330

Number of pulses = 4 × (75-45)/15 = 8

Therefore the motor rotates for 8 × 3.75° = 30°

If the new set angle value is less than the previous set angle value, the result will be negative and the motor will rotate in reverse direction.

Program functions. The program is made up of different functions as explained below.

Senddata( ) sends one byte data to the LCD on its data bus.

sendcommand( ) sends one byte command to the LCD on its data bus.

printstr( ) displays the message or string on the LCD.

inc_angle( ) increments the angle by 15° and displays on the LCD.

dec_angle( ) decrements the angle by 15° and displays on the LCD.

display_value( ) takes the integer angle value as input, converts all digits into ASCII and displays it as angle value on the LCD.

lcd_init( ) configures and initialises the LCD.

adc_init( ) initialises the built-in ADC of AT-Mega16.

rotate_motor ( ) rotates the stepper motor in clockwise or counter-clockwise direction as per the entered angle value till the motor reaches the required position.

Construction and testing

Actual-size, single-side PCB layout of the joystick based stepper motor angle rotation controller using AVR MCU is shown in Fig. 3 and its component layout in Fig. 4. Actual-size, single-side PCB layout of the power supply section is shown in Fig. 5 and its component layout in Fig. 6.

Use any 2-wire electrical cable between CON1 and CON2 to connect 5V power supply to the controller circuit. When the circuit is first switched on, the LCD displays the angle as 0°. The motor also rests at 0°. To set the desired angle, rotate the shaft of the joystick potmeter. As potmeter shaft is rotated counter-clockwise (increase) or clockwise (decrease), the angle is increased or decreased in steps of 15° and is displayed on the LCD. As soon as the angle is changed, the stepper motor starts rotating in order to reach the new angle. For example, if the angle is set to 30° using the potmeter, the motor immediately starts rotating and stops at 30°. If the angle is increased by rotating the potmeter in counter-clockwise direction, the motor also rotates in the same direction. Similarly, if the angle is decreased by rotating the potmeter in clockwise direction, the motor rotates clockwise.

EFY note. The circuit has been checked in EFY Lab with a regular potentiometer instead of a joystick. ●

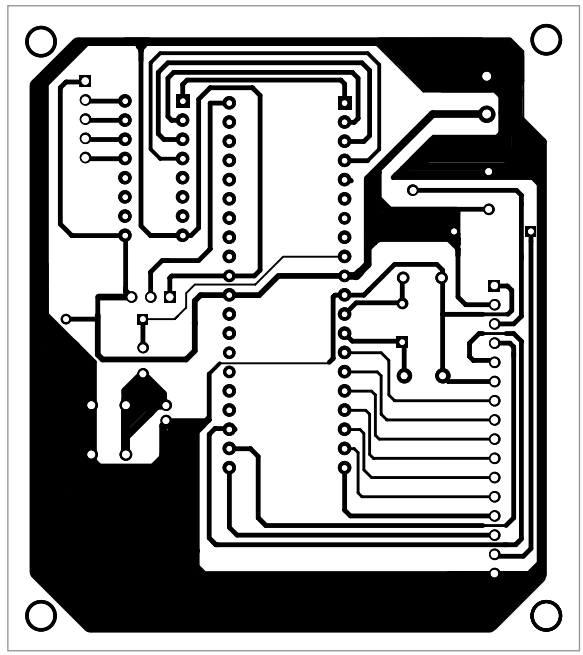


Fig. 3: Actual-size PCB layout of the joystick based stepper motor angle controller using AVR MCU

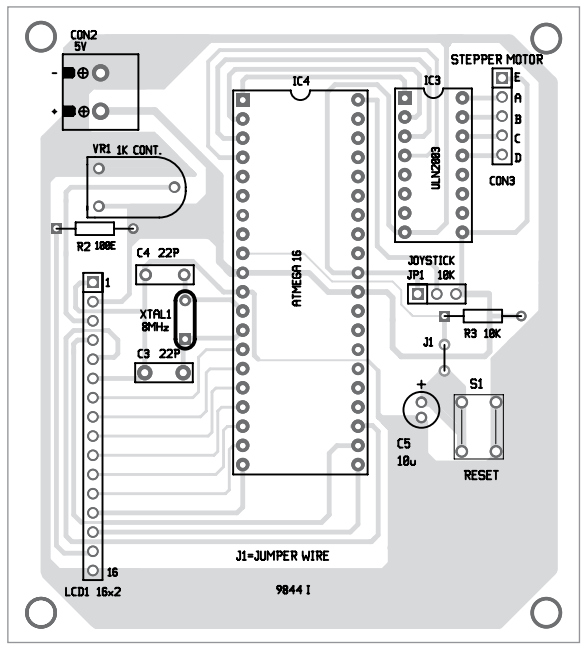


Fig. 4: Component layout of the PCB shown in Fig. 3

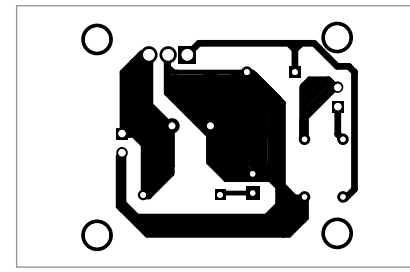


Fig. 5: Actual-size PCB layout of the power supply

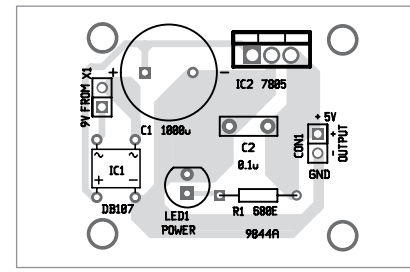
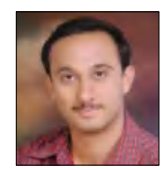


Fig. 6: Component layout of the power supply shown in Fig. 5

EFY Note

The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com*



Ashutosh M. Bhatt is M.Tech in embedded systems. Currently, he is lecturer of electronics and radio engineering at government polytechnic, Jamnagar, Gujarat

Solar **Garden Lamp**

D. MOHAN KUMAR

Described here is an easy-to-make solar night light that can be fixed in the lawn. It automatically turns on in the evening and turns off in the morning.

The rechargeable battery in the unit charges during day time using power from the solar panel. A 0.5W white LED in the circuit gives sufficient light to walk in the lawn's pathway.

Author's prototype is shown in Fig. 1.

Fig. 1: Author's prototype

Circuit and working

Circuit diagram of the solar garden lamp is shown in Fig. 2. It is built around 6V, 350mA solar panel connected across connector CON1, pnp transistor SK100 (T1), a 0.5W white light LED (LED1), 4V, 1Ah rechargeable battery (BATT.1) and a few other components.

The 6V solar panel provides the charging current to the battery during day time and also acts as a light sensor to switch on/off the white LED via transistor T1. During day time, the solar panel generates around 350mA current for charging the battery through forward-biased diode D1. At the same time, base of T1 is held high by the current through resistor R1. Since T1 is a pnp transistor, it remains off during day time due to positive bias from the solar panel. This keeps LED1 turned off.

When sunlight reduces in the evening, current from the solar panel ceases and diode D1 reverse biases. At the same time, T1 becomes forward-biased since its base goes low. This turns on LED1. This condition remains the same till morning when the day light falling on the solar panel reverses the condition. LED1 turns off and the battery starts charging again.

Capacitor C1 is a buffer for the stable charging process. SK100 (or CK100) is a general-purpose medium-power pnp transistor that provides sufficient voltage and current at its collector for the full brightness of LED1. It can handle a maximum of 800mW power.

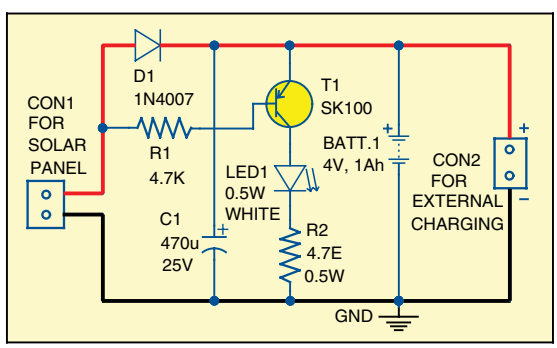


Fig. 2: Circuit diagram of the garden lamp

Since LED1, which may be connected across connector CON3, requires more than 50mA current for maximum brightness, the current limiting resistor (R2) for it should be between 1-ohm and 10-ohm. In the circuit, a 4.7-ohm, 0.5W resistor is used as R2.

Connector CON2 is connected across the battery for charging it from an external charger on cloudy and rainy days. You can use a mobile charger with a suitable socket for the same.

Construction and testing

An actual-size, single-side PCB for the solar garden lamp is shown in Fig. 3 and its component layout in Fig. 4.

Assemble the circuit on the PCB shown in Fig. 4 and enclose it, along with LED1 and battery, in a rain-proof transparent case as shown in the prototype in Fig. 1.

Fix the solar panel on top of it to get direct sunlight. Keep the unit in a place where direct sunlight is available. Use a 4V, 1Ah mini lead-acid battery. ●

PARTS LIST

Semiconductors:	
T1	- SK100 pnp transistor
D1	- 1N4007 rectifier diode
LED1	- 0.5-watt white LED
Resistors (all 1/4-watt, ±5% carbon, unless stated otherwise):	
R1	- 4.7-kilo-ohm
R2	- 4.7-ohm, 0.5-watt
Capacitor:	
C1	- 470E, 25V electrolytic
Miscellaneous:	
CON1	- 2-pin connector terminal
CON2, CON3	- 2-pin connector
BATT.1	- 4V, 1Ah chargeable battery
	- 6V, 350mA solar panel (SP)

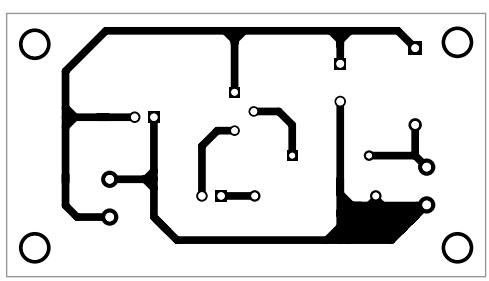


Fig. 3: Actual-size PCB pattern of the solar garden lamp

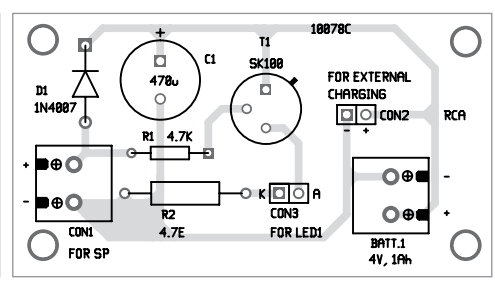


Fig. 4: Component layout of the PCB

D. Mohan Kumar was associate professor at Government College for Women, Thiruvananthapuram, Kerala

Temperature Indicator for °C, °F, °K and °Ra

SUNIL KUMAR

A digital temperature indicator is an immensely useful instrument in the fields of electronics, instrumentation and laboratory use for measurement of temperature. The different types and makes of analogue and digital temperature indicators available in the market are expensive and give temperature readings on a single scale. Presented here is a microcontroller (MCU) based temperature indicator that can display the temperature in four different scales such as Celsius, Fahrenheit, Kelvin and Rankine. It can measure temperatures from 0°C to 150°C.

Celsius temperature scale is based on 0°C for freezing point and 100°C for boiling point of water, with the interval between the two being divided into 100 equal parts. This scale is used in scientific work everywhere.

Fahrenheit temperature scale is based on 32°F for freezing point and 212°F for boiling point of water, with the interval between the two being divided into 180 equal parts.

Kelvin is defined as the scale of temperature with absolute zero as zero and the triple point of water as 273.16K. (Triple point of a substance is the temperature and pressure at which the three phases—gas, liquid and solid—of that substance coexist in thermodynamic equilibrium.) On this scale, 0K represents absolute zero, which is the temperature at which molecules of a substance have their lowest possible energy. Many physical laws and formulae can be expressed more simply by using an absolute temperature scale. Accordingly, Kelvin scale has become the international standard for scientific temperature measurement.

Rankine scale measures thermodynamic temperature corresponding to Fahrenheit. Zero in Rankine is the same as zero in Kelvin. A temperature of -459.67°F is equal to 0°R.

Relations between Celsius and other scales are given in the table below.

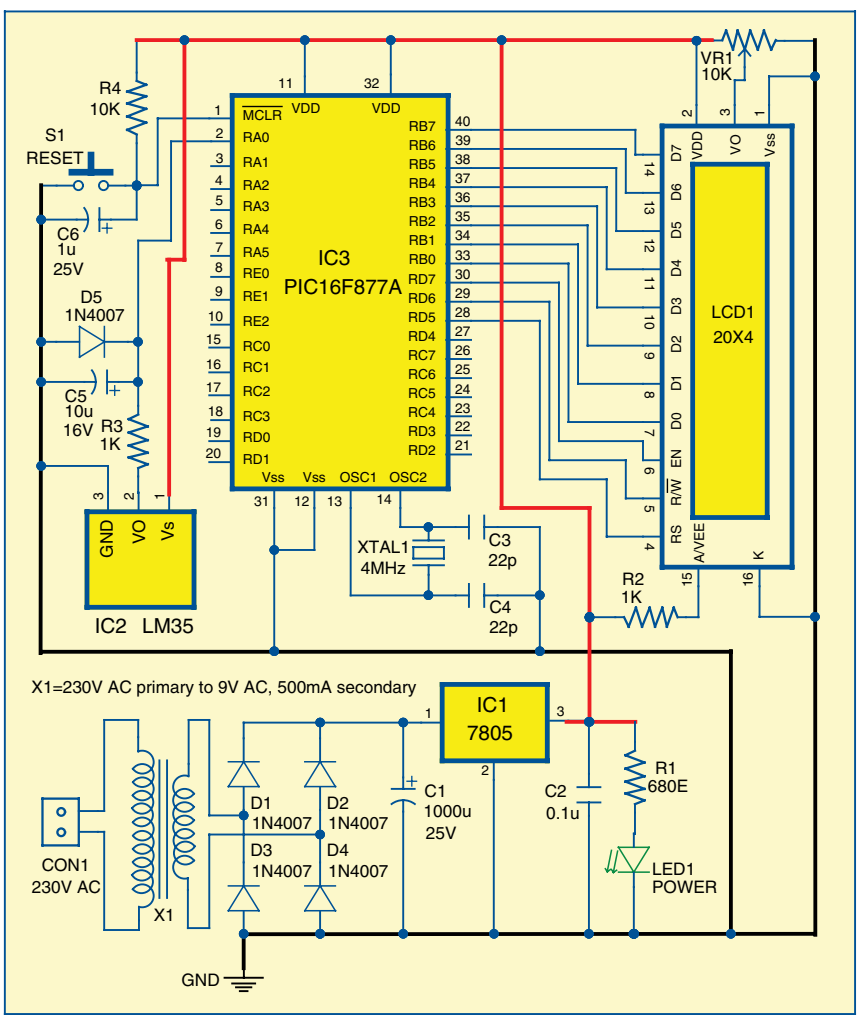


Fig. 1: Circuit diagram of the temperature indicator

Circuit and working

Fig. 1 shows the circuit diagram of the temperature indicator. It comprises voltage regulator 7805 (IC1), temperature sensor LM35 (IC2), micro-

Relations Between Celsius and Other Scales

Celsius	Fahrenheit	F=(C×1.8) +32
Celsius	Kelvin	K=C+273.16
Celsius	Rankine	Ra=(C×1.8) +32+459.67

PARTS LIST

Semiconductors:

IC1	- 7805, 5V voltage regulator
IC2	- LM35 temperature sensor
IC3	- PIC16F877A MCU
D1-D5	- 1N4007 rectifier diode
LED1	- 5mm LED

Resistors (all 1/4-watt, ±5% carbon):

R1	- 680-ohm
R2, R3	- 1-kilo-ohm
R4	- 10-kilo-ohm
VR1	- 10-kilo-ohm potmeter

Capacitors:

C1	- 1000□F, 25V electrolytic
C2	- 0.1µF ceramic disk
C3, C4	- 22pF ceramic disk
C5	- 10□F, 16V electrolytic
C6	- 1□F, 25V electrolytic

Miscellaneous:

LCD1	- 20×4 LCD
XTAL1	- 4MHz crystal oscillator
S1	- Tactile switch
CON1	- 2-pin connector terminal
X1	- 230V AC primary to 9V AC, 500mA secondary transformer

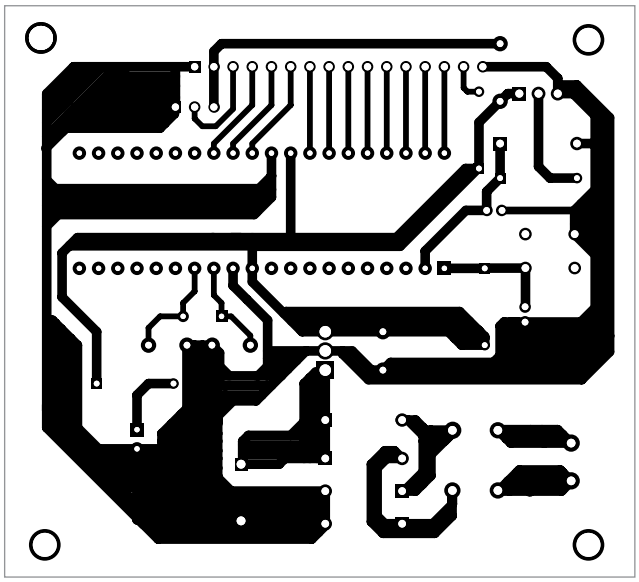


Fig. 2: Actual-size PCB pattern of the temperature indicator

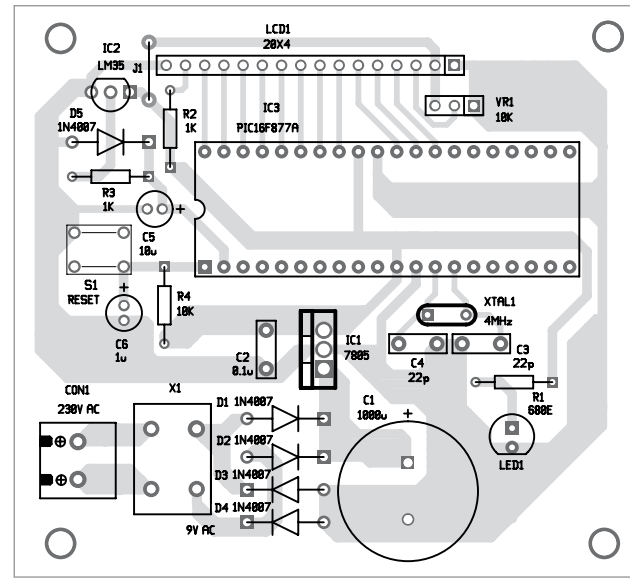


Fig. 3: Component layout of the PCB

EFY Note

The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com*

controller (MCU) PIC16F877A (IC3), a 20 × 4 LCD display module (LCD1) and a few discrete components. LM35 is a precision integrated circuit temperature sensor, whose output voltage is linearly proportional to Celsius (Centigrade) temperature.

This sensor has a linear +10.0 mV/°C scale factor. It operates from 4V to 30V. It measures from –55 to +150°C temperature range. LM35 output is given to the analogue-to-digital converter (ADC) of the MCU. This Centigrade temperature is converted to Fahrenheit (°F), Kelvin (°K) and Rankine (°Ra), and displayed on the LCD module.

Analogue channel AN0 of the MCU receives the analogue signal from the temperature sensor for conversion to its 10-bit digital equivalent. A 4MHz crystal is connected to pins 13 and 14 of the MCU to provide a basic clock frequency.

Active low-reset function is provided by combining resistor R4 and capacitor C6. Switch S1 is used for the manual resetting of the MCU.

230V AC mains voltage is stepped down by transformer X1 to deliver the secondary output of 9V, 500mA. Transformer output rectified by full-wave rectifier comprising diodes D1 through D4 is filtered by capacitor C1. DC output is regulated at +5V by IC1. Capacitor C2 is used to bypass ripples, if any, in positive supply.

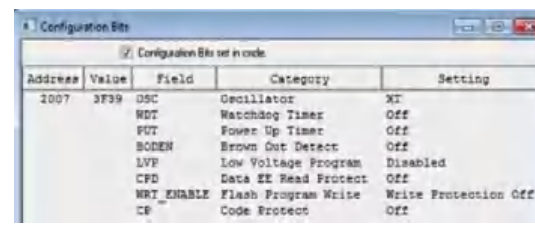


Fig. 4: Configuration bits

Construction and testing

An actual-size, single-side PCB for the MCU based temperature controller is shown in Fig. 2 and its component layout in Fig. 3. Assemble the circuit on the PCB to minimise assembly time and errors. Use an IC base for the MCU.

Software

The program is written in C language and compiled using HI-TECH compiler along with MPLAB to generate a hex code. The generated hex code is burnt into the MCU using a programmer with configuration bits as shown in Fig. 4. The program is well commented and easy to understand.

The software program consists of lcd.h header file and many other functions. The header file is used to control the LCD module for initialising and to display the various messages and datum such as temperature. There are many functions like delay, hex-to-bcd, display, ADC_Init, ADC_Read and Temperature that are used in the program for various functions.

Delay function is used to provide the delay as per variable time. ADC of MCU PIC16F877A is initialised for ADC operation by ADC_Init function. Function ADC_Read takes the analogue signal, converts it into digital data and returns for analogue temperature equivalent digital data.

Converted digital data is converted into bcd format by hex-to-bcd function. Temperature function is used to convert ADC data into various temperature parameter units. Display function is used to display the data on the LCD.

Sunil Kumar is BE (electronics engineering), College of Engineering, Dr Ambedkar Institute of Technology, Bengaluru

Sensing Peripheral Devices with MC1489A Receiver

PETRE TZV PETROV

Presented here is a circuit for monitoring the status of electrical or peripheral devices using the classical MC1489A receiver found in RS232 based devices. RS232 standard is still widely incorporated in embedded systems. Sometimes, there are unused or spare MC1489A receivers in RS232 interface circuits. Fortunately, these can be used for monitoring the status of electrical circuits or mechanical switches. This saves money and space and also adds some safety to embedded systems because receivers for RS232 have internal protection and Schmitt triggers for better noise immunity. MC1489A captures information from peripheral devices that are not TTL/CMOS compatible but are in the working range of this receiver.

Circuit and working

Circuit diagram of the sensing peripheral devices with MC1489A receiver (IC1) is shown in Fig. 1. It consists of four examples for sensing the signals from peripheral devices such as simple DC motors (M1), incandescent lamps (BL1) and DC motor (M2) driven by a full-bridge circuit with four switches (S3-S6) to control bipolar DC voltages. Status of each device is indicated by four LEDs (LED1 through LED4). For example, if switch S1 is closed, bulb BL1 will glow. Status of switching on the bulb is indicated by the glowing of LED2.

MC1489A converts bipolar signals into CMOS/TTL signals. It is a quad-line receiver with response controls (RC1 through RC4). Response control lines are not used here. However, these are included in this design to facilitate users for future applications or expansion.

LED1 through LED4 are connected

PARTS LIST

Semiconductors:
IC1 - MC1489A receiver
D1-D5 - 1N4007 rectifier
LED1-LED4 - 5mm LED
Resistors (all 1/4-watt, ±5% carbon):
R1-R4 - 2.2-kilo-ohm
Capacitors:
C1-C3 - 0.1µF ceramic disk
Miscellaneous:
S1-S6 - On/off toggle switch
BL1 - 24V, 0.1A or similar bulb
M1, M2 - 24V, 0.1A or similar DC motor
CON1, CON3, CON4 - 3-pin berg strip connector
CON2 - 2-pin berg strip connector
CON5 - 5-pin berg strip connector

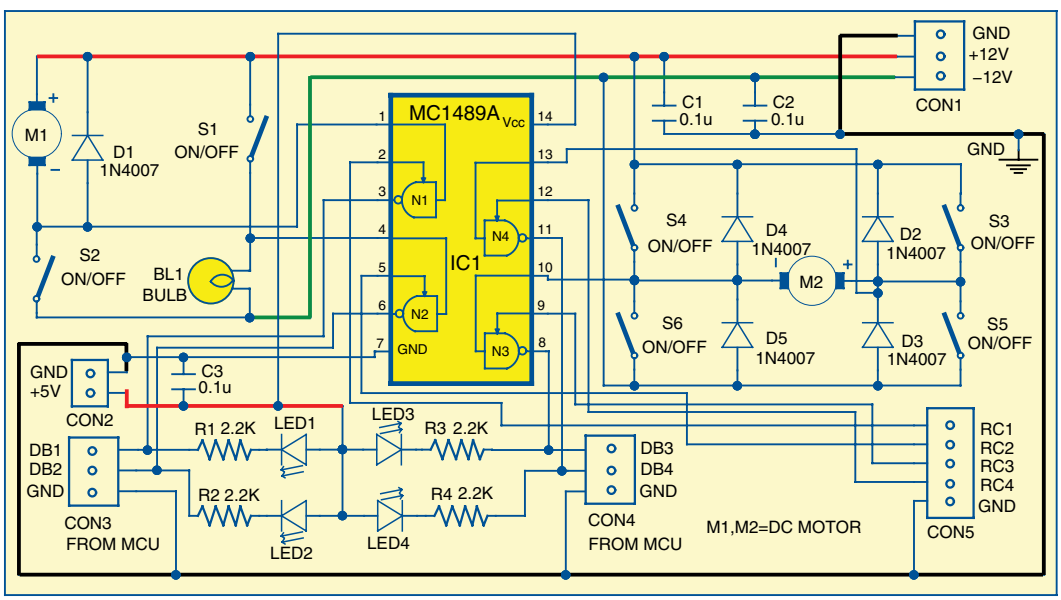


Fig. 1: Circuit diagram of the sensing peripheral devices with MC1489A receiver

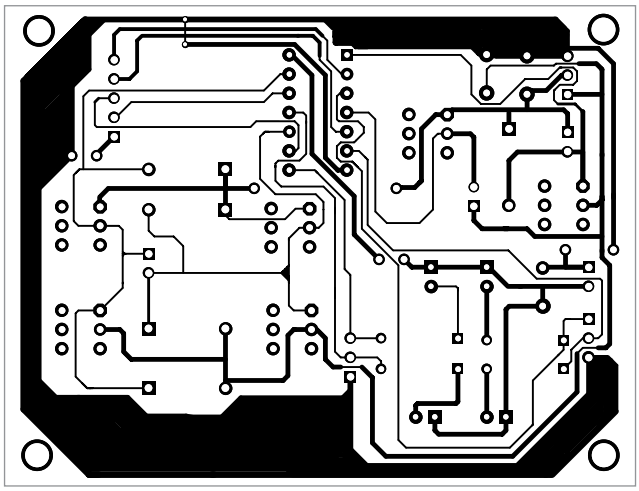


Fig. 2: Actual-size PCB layout of the sensing peripheral devices circuit

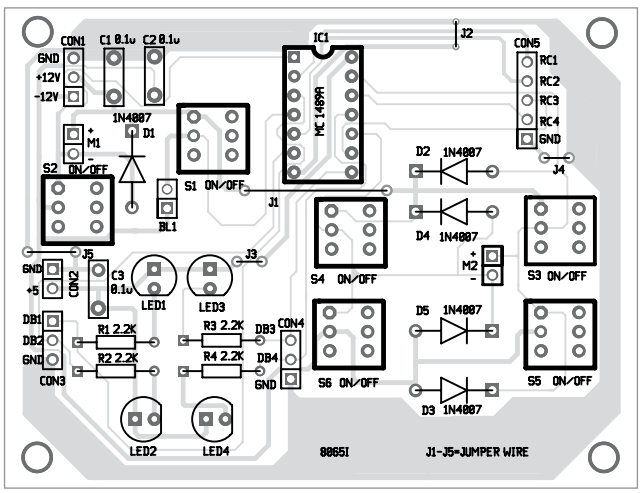


Fig. 3: Component layout of the PCB

to these receivers. You can add protection resistors, capacitors and diodes for inputs of IC1, if required. Also, you can interface any microcontroller (MCU) directly to IC1. Data outputs (DB1 through DB4) of MC1489A can be read with simple input commands from the MCU.

Switches S1 through S6 can be of any kind, be it electronic (transistors) or electromechanical (relays). Ensure that the voltages supplied to MC1489A through these switches do not exceed its operating range. Maximum input voltage range of MC1489A is ±30V.

Construction and testing

Actual-size, single-side PCB layout of the circuit for sensing and controlling peripheral devices with MC1489A receiver is shown in Fig. 2 and its component layout in Fig. 3.

Testing the circuit is very simple. If you do not have actual loads, you can replace bulb BL1 and motors M1 and M2 with appropriate resistors. For example, you may replace these with resistors of 200-ohm, 3W for power supply of ±12V. This will provide currents of 24V/200-ohm = 120mA through loads, when corresponding switches are closed. This current will imitate the working current of the loads.

Switch off and switch on switches S1 through S6 in any working combination. You will notice that the status of the LEDs changes according to the status of the switches.

Pay special attention to the controlling of DC motor M2 in the bridge configuration.

Closing switches S3 through S6 using the right combination is essential; otherwise, there will be a short circuit. Never close switches S3 and S5, and/or S4 and S6, at the same time. To turn on M2, you can close only S3 and S6, or S4 and S5, switches at the same time. ●

Petre Tzv Petrov was a researcher and assistant professor in Technical University of Sofia, Bulgaria, and expert-lecturer at OFPPT (Casablanca), Kingdom of Morocco. He is currently working as an electronics engineer in the private sector in Bulgaria

Simple Prescaler for Transmitters

JOY MUKHERJI

Most phase-locked loop (PLL) based transmitters use a prescaler chip at the heart of their oscillator. A single-chip prescaler like SAB6456 is a divide-by-64 or divide-by-256 switchable prescaler. It offers high sensitivity and ease of use. But electronics hobbyists, particularly in India, have a tough time finding these chips in the market.

The circuit presented here solves this problem by using three low-cost, readily-available integrated circuits (ICs) and offering three common divider rates of 64, 128 and 256. It works well from 1MHz to 150MHz and is suitable for use in PLL FM transmitters and other frequency synthesisers for HAM band including 2-metre amateur radio band (144MHz-148MHz).

Test Points

Test point	Details
TP0	GND
TP1	12V DC
TP2	5V
TP3	RF input frequency /4
TP4	RF input frequency /16
TP5	RF input frequency /32
TP6	RF input frequency /64
TP7	RF input frequency /128
TP8	RF input frequency /256

PARTS LIST

Semiconductors:

IC1	- 7805, 5V voltage regulator
IC2, IC3	- 74AC74 dual D flip-flop
IC4	- CD4040 ripple counter
T1, T2	- 2N2222 npn transistor
LED1	- 5mm LED

Resistors (all 1/4-watt, ±5% carbon):

R1, R2, R5, R7	- 10-kilo-ohm
R3, R4	- 220-kilo-ohm
R6	- 3.3-kilo-ohm

Capacitors:

C1	- 100µF, 25V electrolytic
C2, C4, C5	- 0.1µF ceramic disk
C3	- 10pF ceramic disk

Miscellaneous:

CON1	- 2-pin connector terminal
CON2	- 4-pin connector
JACK1	- RF jack interface connector
	- 2-pin connector

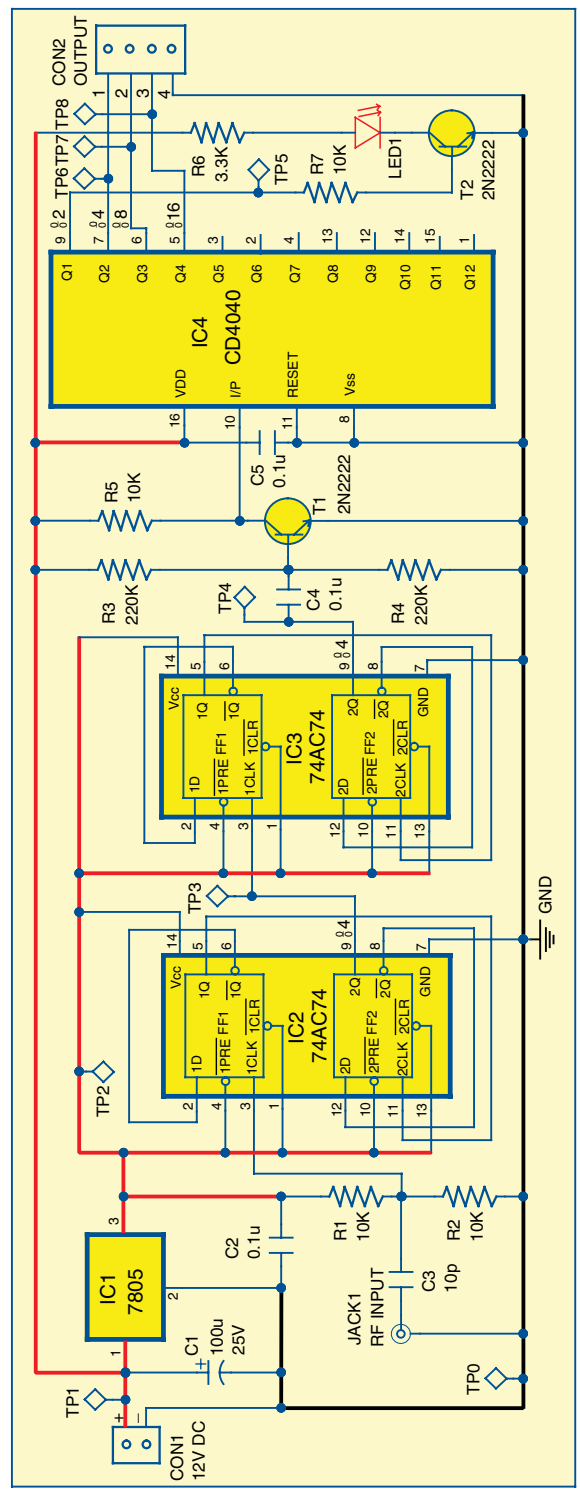


Fig. 1: Circuit diagram of the simple prescaler for transmitters

Circuit and working

Circuit diagram of the simple prescaler for transmitters is shown in Fig 1. It is built around voltage regulator 7805 (IC1), dual D-type positive-edge-triggered flip-flop 74AC74 (IC2 and IC3), ripple-carry binary counter CD4040 (IC4) and a few other components.

The four cascaded flip-flops in IC2 and IC3 have been configured to divide the input signal by a factor of 16. Radio frequency (RF) input (at JACK1) from the oscillator is applied to pin 3 of IC2 via capacitor C3. Signal from IC2 pin 9 is fed to pin 3 of IC3. Transistor T1 converts TTL output of IC3 to CMOS logic levels to drive clock input to pin 10 of binary counter IC4.

Output divider rates of 64, 128 and 256 are available at pins 1, 2 and 3 of CON2, respectively. The circuit can directly drive a CMOS divider chip like CD4059 (not shown here). LED1 indicates that the prescaler is working normally. In the absence of RF input, LED1 remains off.

Construction and testing

An actual-size, single-side PCB pattern of the simple prescaler for transmitters is shown in Fig. 2 and its component layout in Fig. 3.

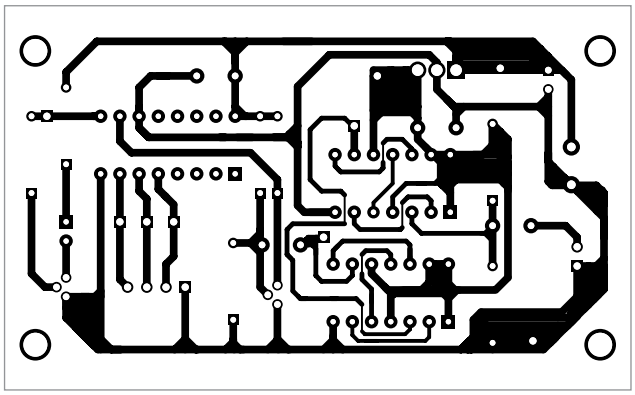


Fig. 2: Actual-size PCB pattern of the circuit of the simple prescaler for transmitters

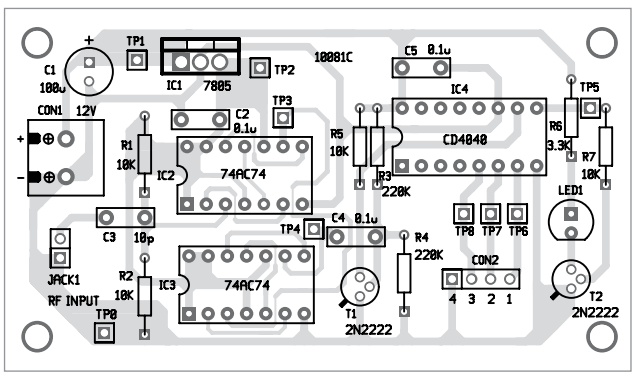


Fig. 3: Component layout of the PCB

Assemble the prescaler on the PCB shown above or on a general-purpose PCB and enclose it in a suitable case. Use a shielded cable or a thin coax for input and output connections. Mount input (CON1), output (CON2) and RF jack (JACK1) on the panel. Keep all component leads as short as possible. A 12V regulated power supply is recommended.

During testing, the prescaler performed well with an input frequency of 150MHz. Verify that test points in the circuit are as per the table before using the circuit.

To test the circuit, ensure there is 12V at test point TP1 and 5V at test point TP2 with respect to TP0, to verify the correct power supply. Now, give the RF signal using a function generator and measure the frequencies at different test points using an oscilloscope.

EFY Note. The circuit was tested successfully up to 10MHz RF frequency with around 1Vrms to 7Vrms. ●

Joy Mukherji is an electronics hobbyist and a small-business owner in Albany, New york, USA. His interests include designing RF circuits

Home Theatre **Backlight Unit**

T.K. HAREENDRAN

If you have watched your LCD/plasma television late at night in complete darkness with all lights switched off, you might have experienced an irritating eye strain or headache after some time. The reason behind this is that, the lone light source, the television set, has an ever-shifting level of light as the images roll across the screen, sometimes rather too dark and other times very bright. With this rapid changing of light, your pupils dilate and contract to adjust to the change. The proven way to address this is to shrink the pupils with some incidental lighting, or even better, backlighting.

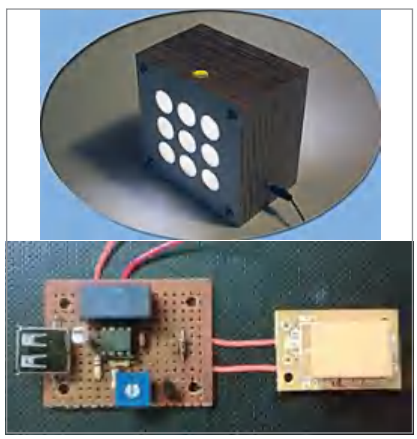


Fig. 1: Author's prototype

Backlighting works best when a flat-panel TV is set up on a TV stand close and parallel to the wall. Backlighting offers an advantage over incidental lighting; it delineates the black bezel around the screen and highlights it. This heightens the already high contrast of the black bezel to the screen and wall, and gives it a 3D effect, which is very pleasing. Fig. 1 shows the author's prototype of the home theatre backlight unit.

Described here is a no-frills home theatre backlight system based on inexpensive white/blue LEDs.

The unit is compact and has a rich light output offered by a total of nine LEDs. As shown in the circuit diagram, the system is an improved version of the classic ambient-light sensor circuitry.

The circuit needs a supply voltage of 12V, but care should be taken to ensure that adequate current is available for the whole system. (In dormant state, the circuit draws a current of about 10mA and in operating state, a current determined by the electromagnetic relay and LEDs.) The backlight unit may be encased using a small homemade wooden box as shown in Fig. 1.

Circuit and working

Circuit diagram of the home theatre backlight unit is shown in Fig. 2. It is built around light-dependent resistor LDR1, op-amp LM358 (IC1), transistor BC547 (T1), nine LEDs (LED1 through LED9), 12V, 1C/O relay (RL1) and a few other components.

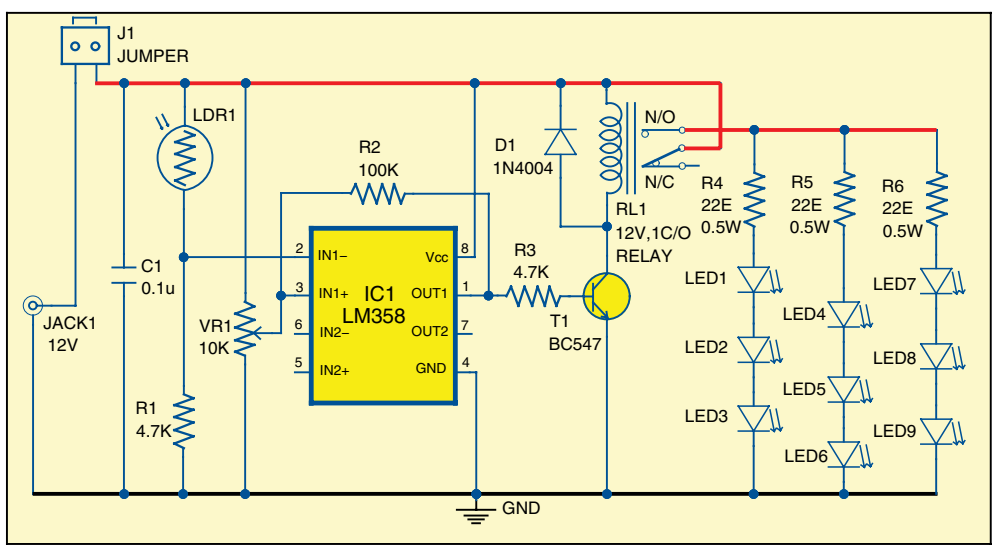


Fig. 2: Circuit diagram of the home theatre backlight unit

The LDR has very low resistance when exposed to high-intensity light and very high resistance when it is in the dark. LDR1 and resistor R1 form a voltage divider connected at the inverting (IN1-) input of IC1. Non-inverting (1N1+) input of IC1 is connected to 10-kilo-ohm potmeter VR1 to adjust the switching-threshold level as desired.

If ambient light level is sufficient, the circuit is in quiescent state. When the light level decreases, resistance of LDR1 increases, which causes voltage across resistor R1 to decrease,

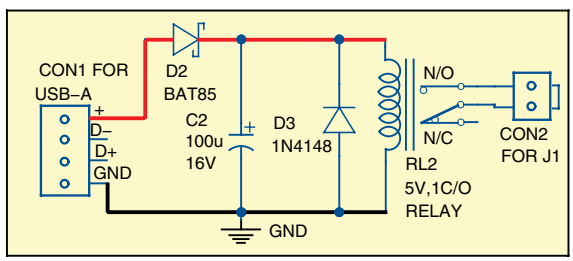


Fig. 3: Circuit diagram of the USB switch

Gift 'Knowledge' To Your Friends and Your Near and Dear!

On birthdays, anniversaries and occasions like Diwali, New Year or Eid, you may be looking for gifts that are useful for the recipients and also last long. If so, what could be better than gifting a magazine that they may like and that would add to their knowledge, month after month.

If the person you want to gift to is an electronics engineer or likes the subject as an industrialist, academician, student or a hobbyist, you may consider gifting him Electronics For You, the most popular magazine on the subject. He/she will love you for it – every time he/she looks at it.

If the person you have in mind is interested in electronics as a businessman or as a non-technical person, gift him/her subscription to Electronics Bazaar, which is far above the rest in terms of the latest and credible information it offers.

For those interested in software, what can be better than Open Source For You magazine. It would keep the person updated with the latest in the field of 'open' and free software available – saving a lot of money in the long run. It comes with a DVD packed with very useful information/software every month.

What's amazing is that gift subscription to any of these magazines would cost you much lesser then what you would normally be paying for most other gifts! Please check the amount below that you have to pay for 12 issues, including packaging and forwarding:

Magazine	You Pay (Rs)
Electronics For You*	☐ 960
Electronics Bazaar**	☐ 960
Open Source For You	☐ 960

**For Electronics For You Plus edition that includes a very useful DVD every month besides delivery by courier.*

***It includes LED Bazaar*

The subscription can start from any issue/month you desire, though normally a magazine is mailed from the next issue being sent to all the readers.

One more thing: Access to digital version of the magazine(s) will also be provided to the person you are gifting to, so that they do not miss the information in case of any postal delay in receipt of their copies.

And, if you are not subscribing to the magazine(s) yourself yet, don't forget to gift it to yourself first!

Please note, these rates are likely to increase soon! So please send your order before the increase to avail these rates.

To Subscribe Online, Visit: http://subscribe.efyindia.com

DONOR:

Name_____ Mailing Address_____

_____ City_____ Pin Code_____

State_____ Phone_____ Email_____

I would like to gift subscription to the above (✓) marked magazine(s) starting from_____. Please find enclosed a sum of Rs_____ by DD/MO/crossed cheque*bearing the No._____ dt._____ in favour of **EFY Enterprises Pvt Ltd**, payable at Delhi. (*Please add Rs 50 on non-metro cheque)

RECIPIENT MAILING DETAILS:

Name_____

Mailing Address_____

_____

City_____

Pin Code_____ State_____

Phone_____ Email_____

EFYGROUP Technology Direct Ltd

EFY Enterprises Pvt Ltd
D-87/1 Okhla Industrial Area, Phase 1, New Delhi 110020

Phone:
011-26810601 – 03

Email:
info@efy.in

www.efy.in

Terms:- # The rates are valid for subscribers within India only.# Please allow 4-6 weeks for processing of the subscription.# Disputes, if any, are subject to exclusive jurisdiction of competent courts and forums in Delhi/New Delhi only. Replacement will be made if intimation of damaged / non-receipt of copies is received within 30 days of its publication ** After three months, if you are not satisfied with the magazine, your balance amount will be returned.

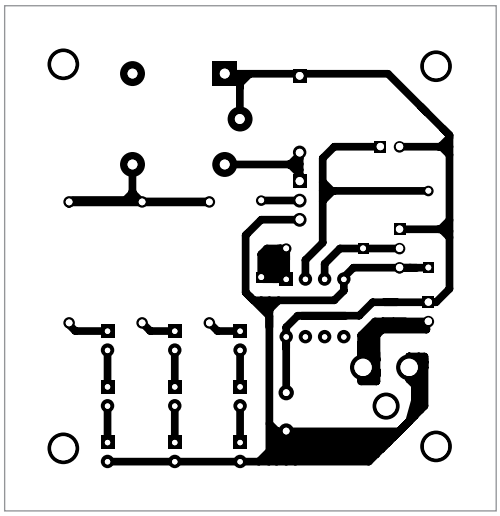


Fig. 4: Actual-size PCB of the home theatre backlight unit

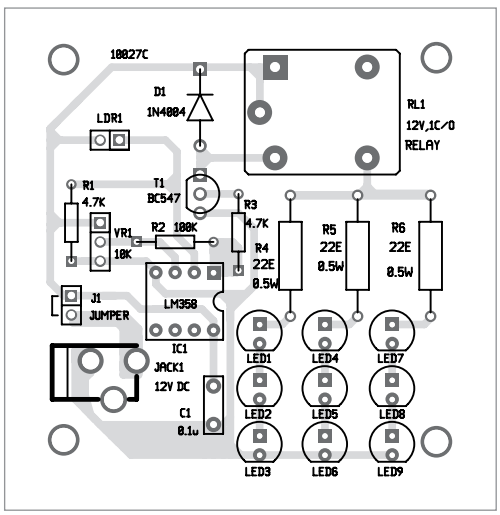


Fig. 5: Component layout of the PCB shown in Fig. 4

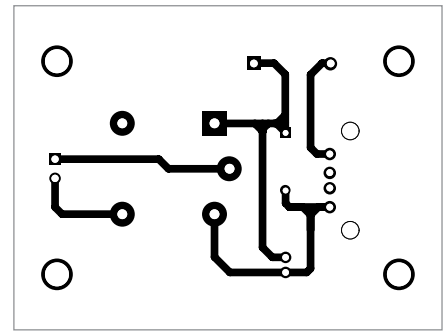


Fig. 6: Actual-size PCB of the add-on USB switch circuit

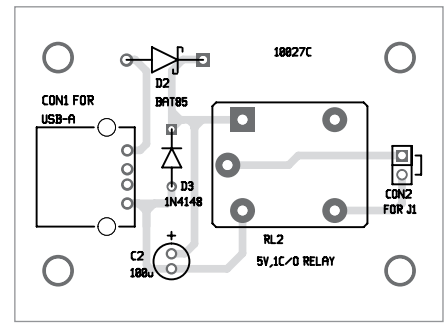


Fig. 7: Component layout of the PCB shown in Fig. 6

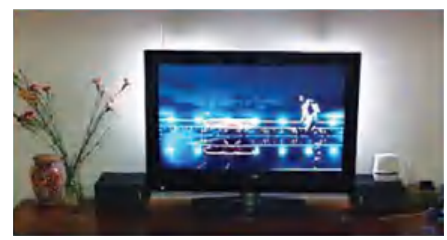


Fig. 8: Real-world application of the home theatre backlight unit

Input of the add-on USB switch circuit (J1) should be connected to a vacant USB port in the television/ set-top box using a standard USB cable so that when the system is in on state, the circuit is activated by the 5V DC supply available from the USB port of the television/ set-top box.

It is very important to prevent the LDR1 to be illuminated by sources other than the natural ambient light.

Construction and testing

An actual-size, single-side PCB for the home theatre backlight unit is shown in Fig. 4 and its component layout in Fig. 5. Similarly, an actual-size, single-side PCB for the add-on USB switch circuit is shown in Fig. 6 and its component layout in Fig. 7. Enclose the PCB(s) in a small wooden box as shown in author's prototype.

LDR1, jumper J1, potmeter VR1 and other components are fitted on the cabinet. Place LDR1 in such a way that only ambient light falls on it. Connect jumper J1 externally through wire in case you are not using a USB circuit.

A picture of the real-world application example is shown in Fig. 8.

EFY notes. 1. White bright 5mm LEDs (LED1 through LED9) were used during testing.

2. The circuit can work with 3.4V/80mA, 10mm white LEDs or with 8mm blue LEDs. ●

PARTS LIST

Semiconductors:

IC1	- LM358 op-amp
T1	- BC547 npn transistor
D1	- 1N4004 rectifier diode
D2	- BAT85 Schottky diode
D3	- 1N4148 signal diode
LED1-LED9	- 5mm white/blue LEDs

Resistors (all 1/4-watt, ±5% carbon, unless stated otherwise):

R1, R3	- 4.7-kilo-ohm
R2	- 100-kilo-ohm
R4-R6	- 22-ohm, 0.5W
VR1	- 10-kilo-ohm potmeter

Capacitors:

C1	- 0.1µF ceramic disk
C2	- 100F, 16V electrolytic

Miscellaneous:

JACK1	- 12V DC jack
CON1	- USB-A connector
CON2	- 2-pin connector
RL1	- 12V, 1 C/O relay
RL2	- 5V, 1 C/O relay
J1	- 2-pin jumper connector
LDR1	- Light dependent resistor (5mm)

which, in turn, causes output of IC1 (pin 1) to go high. This activates RL1 through relay driver transistor T1 and turns on the 5mm white/blue LED strings, LED1 through LED9, connected via N/O relay contacts. Here, creation of hysteresis is achieved by adding resistor R2 in the positive feedback path.

If you want an extra AND function, that is, you want the backlight unit to work only when the television is switched on and ambient-light level is very poor, remove jumper J1 in the main circuit and attach the add-on circuit (USB switch shown in Fig. 3) at CON2. It will work as a shorting jumper when relay RL2 is energised.

T.K. Hareendran is an electronics hobbyist, freelance technical writer and circuit designer

Let's Get Started **With Intel Galileo**

KRISHNA GUPTA

Intel Galileo is a part of Arduino family and is as simple to program even for non-programmers. Arduino philosophy is consistent in Intel Galileo as well. In this article, we shall start with Intel Galileo and then will be able to run our first program. Some more examples like glowing a single LED, multiple LEDs, RGB LED and reading a potentiometer are also presented at the end to help you get hands-on with Galileo board. Intel Galileo board used in this article is shown in Fig. 1 and top view of the board is shown in Fig. 2.

Board interface

Following is the brief description of the components and interfaces of Galileo board:

5V power supply. A 2.1mm centre-positive jack for 5V regulated DC supply is used. Galileo board comes with AC-to-DC power adaptor having an output of 5V, 3A. Voltage input to Galileo board must not be more than 5V.

Ethernet interface. There is one 10Mbps/100Mbps Ethernet interface on board. Ethernet control has a dedicated PHY.

RS232 interface. A 3-pin, 3.5mm jack (audio type) forms the RS232 interface. Ring of the jack is transmitter (TX), tip is receiver (RX) and the sleeve is ground.

USB 2.0 client. To program Galileo board, this port is connected to the computer.

USB 2.0 host. USB2.0 full host supports USB device interface. Up to 128 devices can be connected to this port with the help of a USB device hub.

Arduino interface. There are two interfaces, namely, digital and analogue.

Digital interface. Galileo has 14 digital input/output pins. This in-

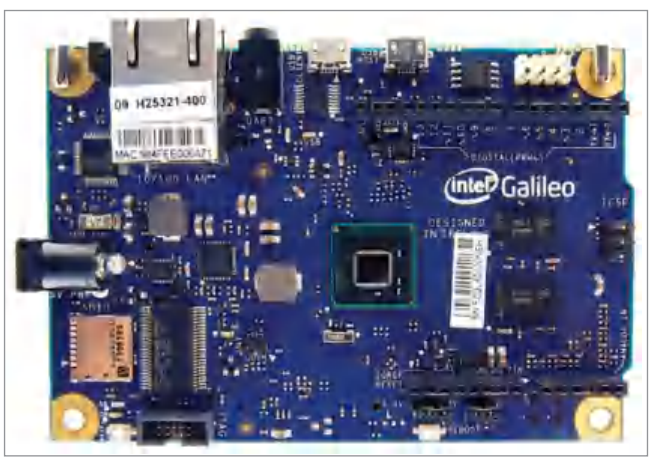


Fig. 1: Intel Galileo board

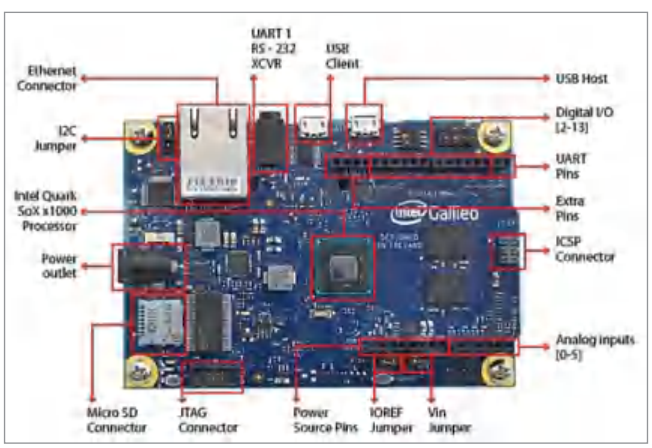


Fig. 2: Top view of Intel Galileo

Fig. 3: Bottom view of Intel Galileo with Intel Centrino N135 connected to PCIe

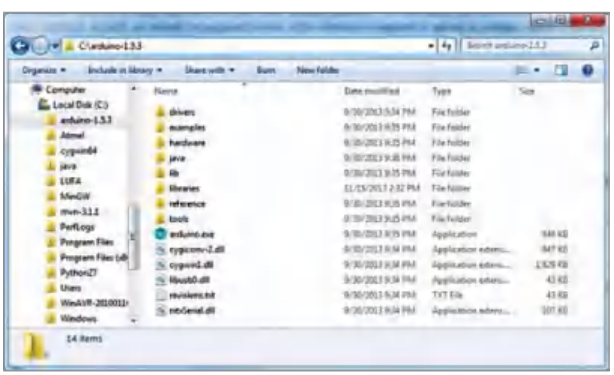


Fig. 4: Location of Arduino-1.5.3 folder

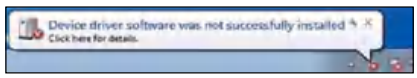


Fig. 5: Error message received during installation

Fig. 6: Galileo appears as Gadget Serial v2.4

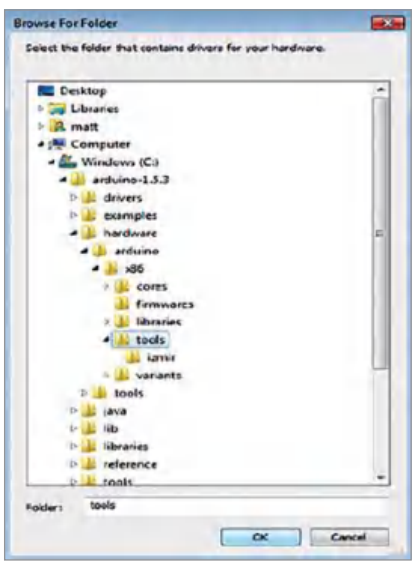


Fig. 7: Browse tools driver software location

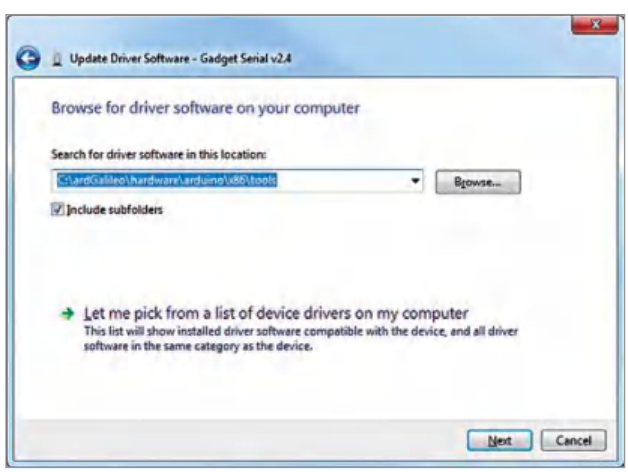


Fig. 8: Click Next to install the driver

cludes UART on pins 0 and 1, I2C pins and SPI pins. Six digital inputs/outputs can be configured as PWM (pins 3, 5, 6 and 9-11).

Analogue interface. It has six analogue inputs (A0-A5). It also has an 8-pin power header that includes 3.3V, 5V, GND and reset pins.

Reboot button. Use this button to reboot Galileo board (including Linux). The system will boot back in around 30 seconds.

Pin 13 LED. This is the LED that we will blink during blink test program.

Arduino sketch reset. This is the reset button that will restart Arduino sketch running in Galileo.

µSD card. It has a micro-SD card slot (compatible up to 32GB micro-SD card) and has an inbuilt dedicated SD controller.

PCIe connector. It has a Full PCI Express mini-card slot with PCIe 2.0 compliant features for Wi-Fi, Bluetooth or mobile connectivity; for Wi-Fi, Intel recommends Intel Centrino N135 mini PCIe wireless module as shown in Fig. 3.

Powering up Intel Galileo

To switch on the board and upload the code, the following components will be required:

Power supply. You can use any supply but make sure that it can keep up to 3A, and output voltage must be regulated to 5V DC. Connect the supply to the 5V input connector.

USB to A/B micro cable. This is included with the board. It is used to connect Galileo board to the computer.

Software for Intel Galileo

Standard Arduino integrated development environment (IDE) does not support Intel Galileo. The supported IDE can be downloaded from *communities.intel.com/docs/DOC-22226*

Download the version that is compatible to your operating system (OS). The versions available are for Windows, Linux (32- and 64-bit versions) and Mac OSes.

Lab note. This project was tested on Windows 7 and Ubuntu 13.04.

Software installation for Windows

Save the unzipped file in C: drive. The unzipped file can be saved by the same name (Arduino-1.5.3) as shown in Fig. 4.

Open Arduino-1.5.3 folder and run arduino.exe to launch Intel Arduino IDE for Galileo.

After software/IDE installation, connect the board to the computer for which you also need to install required drivers.

Connect regulated 5V supply to Galileo and then connect Galileo to the computer via USB cable only when the LED for USB client turns

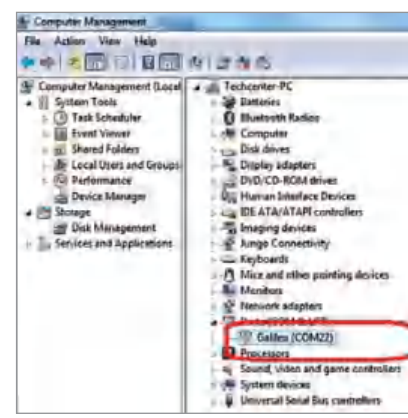


Fig. 9: Galileo COM port

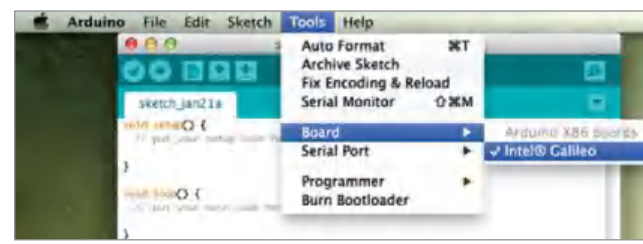


Fig. 10: Selecting Intel Galileo board on Arduino platform

Fig. 11: Choosing COM port

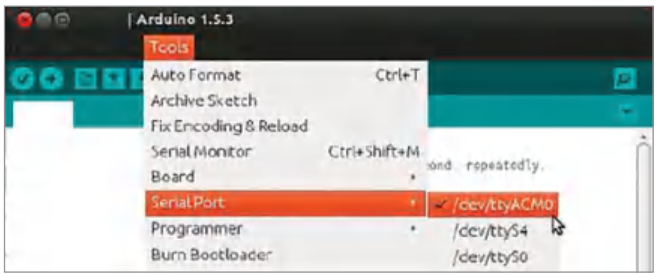


Fig. 12: Choosing ACM0 in Linux

Fig. 13: Running the application in Mac

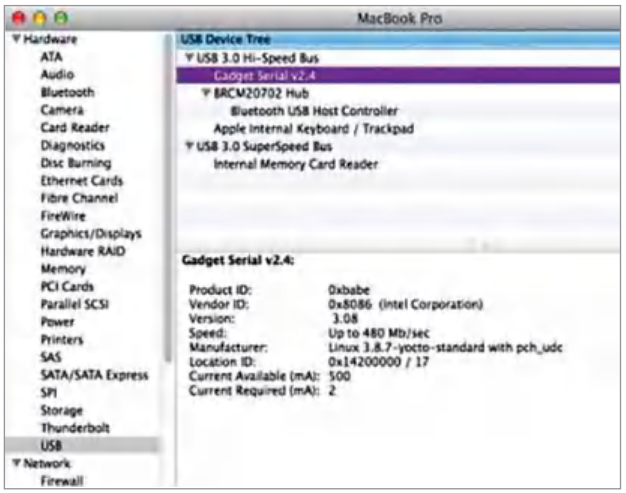


Fig. 14: Choosing the driver on Mac

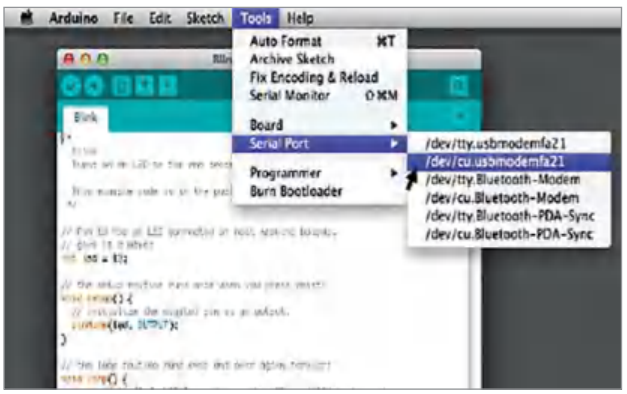


Fig. 15: Arduino on Mac

on. As you connect the board you will receive an error message, that there was some problem in installing the driver as shown in Fig. 5.

Open Device Manager by clicking Start→Control Panel→Systems→ Device Manager options. Under Other Devices you should see Gadget Serial v2.4. Update the driver from the option as shown in Fig. 6.

On the first pop-up window, click Browse my computer for driver software. Then, click Browse for the file location path. If you have installed Arduino in C: root drive, then browse the location to *C:\arduino-1.5.3\hardware\arduino\x86\tools* and click OK as shown in Fig. 7.

After selecting the driver, click Next as shown in Fig. 8. On Windows security alert pop-up window, click Install.

After installation is complete, open Device Manager and locate Galileo com port under Ports (COM & LPT) option as shown in Fig. 9. Note the COM port number; you will need it while uploading software on Galileo.

Open Arduino IDE and select Tools→Board. Make sure that Intel Galileo is selected (Fig. 10).

Under Serial Port, select COM port on which Galileo board is connected (Fig. 11).

Software installation on Linux

Arduino software for Linux is in .tgz format. To extract the file you will need Tar tool. Before going ahead, remove Modem Manager System Service as it can hinder working with Galileo. Remove it by running the following command on the terminal:

```
sudo apt-get remove modemmanager
```

On the terminal, navigate to the folder in which Arduino IDE is downloaded (in this case, it is in Downloads) and extract the file by running the following commands:

```
cd~/Downloads
tar -xzf <Arduino1.5.3_Galileo.tgz>
-C ~/
```

Navigate to the extracted file and run Arduino by running the following commands:

```
cd ~/arduino-1.5.3
sudo ./arduino
```

(Arduino has been run as root because sometimes Arduino does not launch properly without root privilege.)

Driver installation. After software installation on the computer is complete, connect the board to the computer and install drivers.

Connect regulated 5V supply to Galileo and then connect Galileo to the computer via a USB cable.

On the terminal run the following command and note down the port of Galileo (in our case it is ACM0):

```
ls /dev/ttyACM*
```

In case you see an error message Java not found, install Java by running the following command:

```
sudo apt-get install default-jre
```

To select Serial Port, go to Tools→Serial Port→/dev/ttyACM0 (Fig. 11).

Software installation on Mac OS

For Mac, unzip the application and save it to the application folder. If you have other Arduino versions, you can save the file by any name, only keep in mind that there should be no spaces in the name. Run the application by double-clicking on it (Fig. 13).

Driver installation. Once software installation is complete, you need to install the driver using the following steps (also shown in Fig. 14):

Connect 5V DC power to the board and then the USB cable (power should always be the first connection on Galileo board).

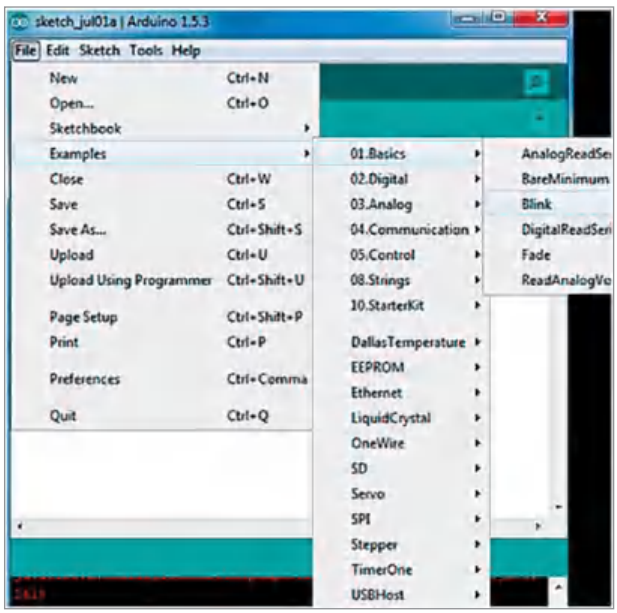


Fig. 16: Uploading Blink example code on Windows

Fig. 17: Status of uploading the code

Allow a few seconds for the board to boot up. Open System Information window to check if the board has been detected properly. Path for the same is: Hold Options→Apple menu→System Information. Under USB, check Gadget Serial v2.4 .

Under Network, check the name of your Galileo device; it should be similar to usbmodemxxxx. In this case it is fa21. Note the number as you will need it while uploading the code.

Go to Tools→Serial Port→/dev/cu.usbmodemfa21 as shown in Fig. 15.

Uploading the code

The procedure for uploading Blink example code is the same for Windows, Linux and Mac OSes. To upload Blink example sketch, select the code from the path File→Examples →01.Basics→Blink (Fig. 16).

A new code will open. Click on Upload to upload the code (sketch) on the board. Status of the uploading is displayed on the bottom of the screen (Fig. 17).

When the upload is complete, you will see Transfer Complete message and pin 13 LED blinking on Intel Galileo board.

Some more examples

After successfully running our first LED blinking example, we can proceed to more examples like making LEDs to blink at various speeds, driving multiple LEDs with sequential effects, reading analogue input using simple potentiometer and driving RGB LEDs. So let us begin!

You need a breadboard, resistor, an LED and some jumper wires to set up the hardware. Though the board already has an LED connected to pin 13, we will connect an external LED to feel the experiment. Fritzing software comes handy when you do not have actual components with you. Here, we will use Intel Galileo Gen2 board image in Fritzing environment. (Intel Galileo Gen2 is the upgraded version of Intel Galileo.)

Blinking LED. Wire up the circuit with a 330-ohm resistor using Fritzing as shown in Fig. 18. You can change the blinking speed by varying the delays in blink.ino program.

Multiple LEDs. Let us move one step further and connect multiple LEDs. Connect the hardware

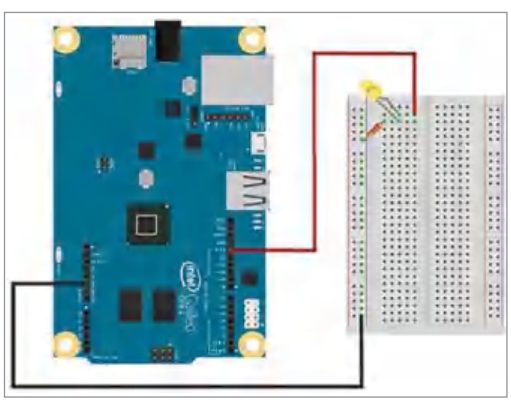


Fig. 18: Circuit for LED blinking example

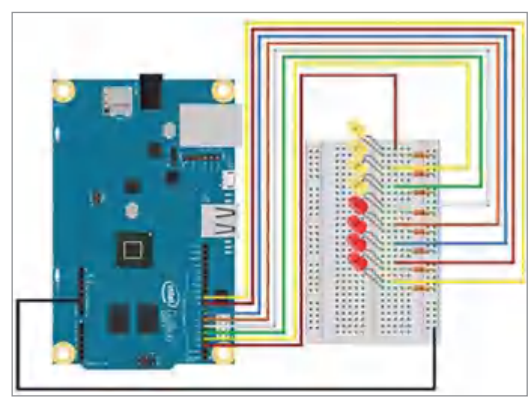


Fig. 19: Circuit for multiple blinking LEDs

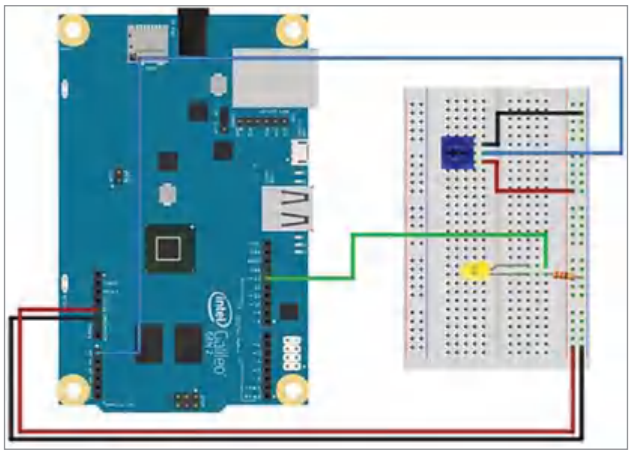


Fig. 20: Circuit of interfacing a potentiometer and LED

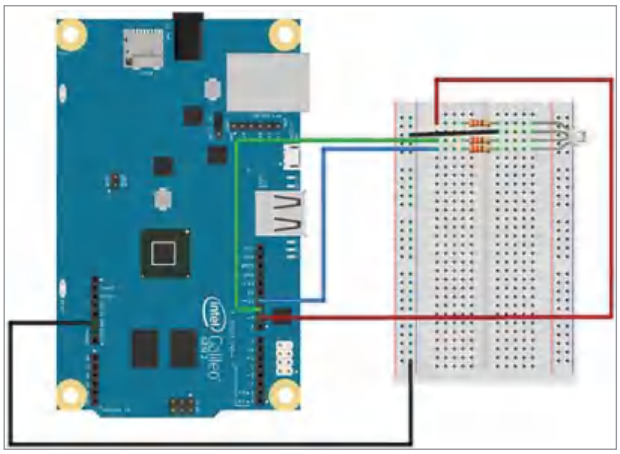


Fig. 21: Circuit of interfacing RGB LED

EFY Note

All the example source codes of this project are included in this month's EFY DVD and are also available for free download at *source.efymag.com*

as shown in Fritzing diagram (Fig. 19). All eight LEDs will turn on/off simultaneously and then create lighting sequences in both right and left directions as defined in sequence. ino code.

Reading potentiometer. In this experiment, we connect a potentiometer to the board as shown in Fig. 20. The code (potm.ino) reads the resistance values and controls the blinking rate of an LED at pin 13, corresponding to the position of the knob.

Driving RGB LED. RGB LED is another piece of hardware used here to have some more fun. Connect the hardware as shown in Fig. 21. Once you upload the code, you will see different colours generated from the RGB LED as defined in rgb.ino code. ●

Krishna Gupta is an electronics hobbyist

Frequency Shift Keying
Communication Simulator

JITENDRA JANGID

Frequency shift keying (FSK) is a frequency-modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier wave. It uses a pair of discrete frequencies to transmit binary (0s and 1s) information. Information and modulated signals are shown in Fig. 1.

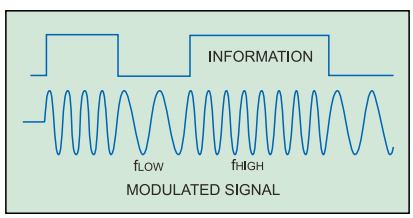


Fig. 1: Digital data and modulated carrier signal

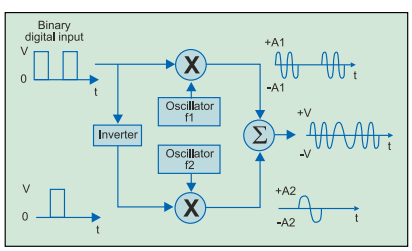


Fig. 2: FSK transmitter block diagram

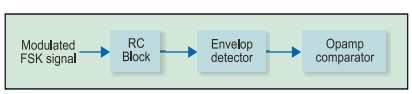


Fig. 3: FSK receiver block diagram

A typical block diagram of an FSK transmitter is shown in Fig. 2. Binary data is modulated with high-frequency sinusoidal signal (f1) and inverted binary data modulated with low-frequency sinusoidal signal (f2). Outputs are combined using an adder circuit to provide the frequency shift keyed signal, which can be transmitted via telephone lines, fibre optics or wireless media. Block diagram of the FSK receiver is shown in Fig. 3.

The transmitter circuit is built around CD4066B quad-bilateral switch (IC1), a digital pulse generator (XFG3), high-frequency oscillator (XFG1), low-frequency oscillator (XFG2) and 7404 hex inverter (IC2). Details of the source, frequency and nature of signals are given in the table.

A high-frequency sinusoidal signal from XFG1 is applied at pins 1 and 8 of IC1, which is controlled by binary data from XFG3 at pins 13 and 6 of IC1. A low-frequency signal from XFG2 is applied at pins 4 and 11 of IC1, which is controlled by binary inverted data applied at pins 5 and12 of IC1.

Specification of Signals

Source	Nature of signal	Specification
XFG1/f1	Sinusoidal wave as carrier I	50kHz, 10V pk-pk
XFG2/f2	Sinusoidal wave as carrier II	9kHz, 10V pk-pk
XFG3	Square wave as data signal	500Hz, 10V pk-pk

The quad-bilateral switch (IC1) produces two amplitude shift keyed signals at pins 2 and 3, which are combined to get the frequency shift keyed signal in XSC1. We are using the remaining two switches for FSK signal generation for the demodulator circuit to ignore the feedback problem.

The receiver circuit is built around high-pass filters (R5 and C2), envelope detectors (D1, C1 and R1) and op-amp comparator circuits (R2, R3, D2, D3 and IC3).

In this section our objective is to generate binary data information (modulating signal). So, initially, we are required to block-frequency components using high-pass filters having a cut-off frequency f = 1/(2 × 3.14 × C2 × R5), which is approximately 10kHz. This blocks the 9kHz low-frequency signal.

After elimination of low frequency, output of HPF is fed to the envelope detector. The envelope detector, a combination of half-wave rectifier with diode 1N4007 and parallel combination (LPF) of resistance (R1) and capacitor (C1), provides the envelope of rectified signal that passes through the operational amplifier working as comparator to generate the square wave using a threshold of 6V. This way we get a demodulated signal with small delay.

The schematic, modulating signal and results of modulated and demodulated signals are shown in Fig. 4. The circuit has been simulated in NI Multisim software. ●

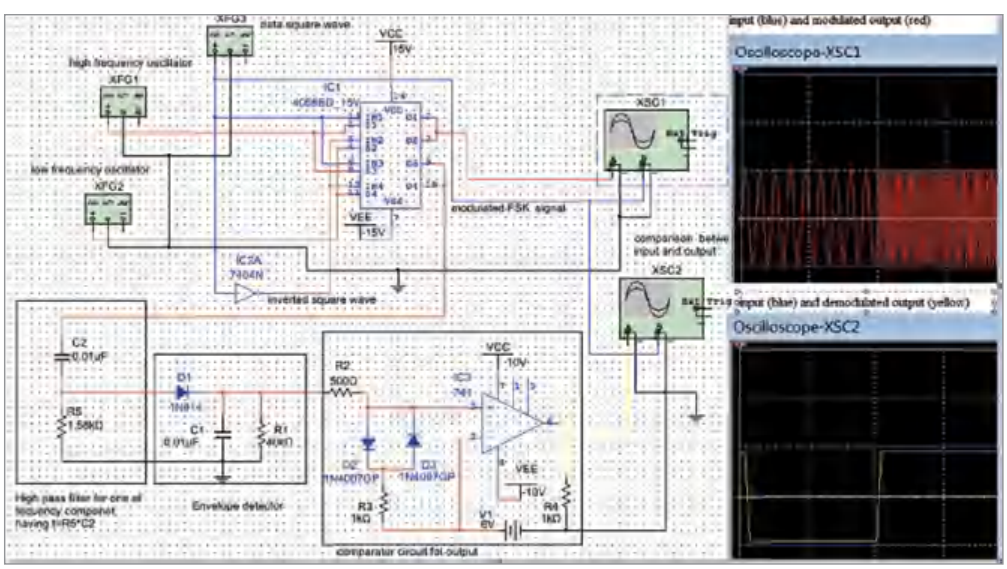


Fig. 4: Circuit diagram of the frequency shift keying communication simulator

Jitendra Jangid is assistant professor at Department of ECE, JNU Jodhpur

ALIVE

'GOD, I COULD KILL FOR THAT RECLINER!'

RELAX! JUST SCAN IT AND GET IT.

INTRODUCING

OneScan

SEARCH WAS NEVER SO EASY!

'NOW WHEN YOU SEE A PRODUCT YOU WANT TO BUY JUST SCAN IT WITH 'ALIVE ONESCAN'

- FIND BEST DEALS
- COMPARE PRICES

SCAN WHAT YOU LIKE

KNOW ITS DETAILS

FIND OUT WHERE TO GET IT

Download app from **aliveonescan.com/app** | Available only on Android

OnePlus X by OnePlus

Celebrating a balance between design and technology

The latest smartphone by OnePlus, OnePlus X, masters the balance between performance and beauty. The screen is created with strengthened, scratch-resistant glass that has withstood the test of time and everyday use.

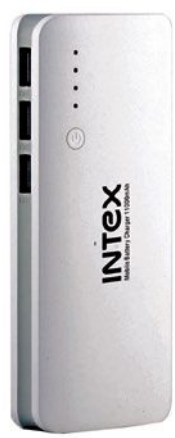
It features OxygenOS based on Android 5.1.1, Qualcomm Snapdragon 801 processor with 2.3GHz quad-core CPUs, 3GB LPDDR3 RAM, 16GB eMMC v5.0 storage (expandable up to 128GB), embedded rechargeable typical 2525mAh lithium-polymer battery, two slots that fit either two nano SIM cards (DSDS) or one nano SIM and one MicroSD card, 13MP rear camera and 8MP front camera. It comes with sensors including accelerometer, gyroscope, proximity, ambient light and HALL.

Price: ₹ 16,999 (available by invite only, exclusively on www.amazon.com)

Power bank from Intex

Never let your devices run out of battery

The new power bank, PB-11K, by Intex features 11,000mAh built-in lithium-ion battery, three USB 2.0 ports to charge multiple devices at a time, and a torch. It has a lifecycle of more than 500, is 26mm thick, weighs 280gm and comes in white colour variant.



Price: ₹ 2300

Lapcare launches portable Bluetooth speakers

Affordable speaker with NFC compatibility, built-in microphone

Lapcare has launched a portable Bluetooth speaker, named iTunes, which brings loud, high-quality music in a small frame. Ergonomically designed with inbuilt LED lights and buttons, the cylindrical-shaped speaker is small enough to fit in your palms. The super-bass Lapcare iTunes resonates through any solid surface, producing the most robust sound for its size.

Price: ₹ 1199

Its dual-mode power supply attributes an optimised playback mode, which can be adjusted for indoor or outdoor listening environments. Outdoor mode provides bright, long-range audio, while indoor mode creates rich sound with deep, full bass delivering full frequency range suitable for all genres of music and, in turn, a lush, optimal sound.

It is enhanced with 300mAH lithium-ion battery that allows users to stream playback music for almost 2.5 hours and 30 days standby, all in one hour of charging.

iRevo Multimedia launches smart PC

Convert your TV into a PC

iRevo smart PC includes a wireless keyboard and mouse, which makes it easy for users to interact with a smart TV from a distance. It comes in two models: model QC1 B08 has 8GB of storage and model QC1B16 has 16GB of storage. The smart PC features a quad-core processor and is powered by Android 4.4. Its WebTop user interface makes it easy to create documents, spreadsheets and presentations, enjoy Web browsing, send/receive emails, Skype with family and friends and play games.

Price: ₹ 7999 for 8GB variant

GizMo ByTes

Indian Railways to launch women safety app

The security and safety measure app is being developed in coordination with Railway Protection Force (RPF) and designed in-house by Eastern Railway. The app, Railway Mobile Instant Tracking Response and Assistance (R-MITRA), immediately sends alerts to the nearest RPF inspector as well as Divisional Security Control Room, providing them with the location and identity of the victim.

Snapdeal launches Snap-lite

Snapdeal has introduced Snap-lite, which is the mobile-optimised version of *snapdeal.com*. Snap-lite will run about 85 per cent faster on slower connections, thus enhancing the overall shopping experience for users. It has been engineered to work on a variety of mobile browsers. The app offers a responsive layout, and the front page shows a search engine followed by a slideshow and list of all major shopping categories.

Union HRD minister to launch e-UGshala

Union Human Resource Development minister Smriti Irani will launch e-UGshala initiative on December 25, 2015, to enable open access to digitised contents for undergraduate learning. The initiative includes 29 undergraduate texts, visuals, self-assessment sheets and books in social science, science and some languages.

New York Times' VR app puts readers inside the story

New York Times has launched its new virtual reality (VR) app, titled NYT VR. It has debuted with two feature films, one titled The Displaced that tells the story of three children swept up in the world's refugee crisis, and the other shows the making of a recent *New York Times* magazine cover. The publication aims to get the reader much more involved than simply reading a story or watching the news on TV passively.

Noise-cancelling headphones from Sony

Experience digital music with high-resolution audio

The new headphones from Sony feature high-resolution audio capability, digital noise cancelling utilising dual noise sensors that reduce ambient noise, 9mm high-sensitivity drivers that reproduce up to 40kHz, built-in lithium-ion battery that plays 16 hours non-stop music, inline remote and microphone for hands-free calls, distinctive single shape design and many other features.

Price: ₹ 9990

Phablet by Lenovo

Portability of a smartphone, fun of a tablet

With a crisp resolution of 326ppi, Lenovo Phab Plus offers a stunning multimedia experience on the go. It has a 17.3cm (6.8-inch) full-HD display with IPS technology, which makes the experience of gaming, watching movies and enjoying all the apps even better.

It features 3500mAh lithium-polymer battery, 13MP rear camera with auto-focus and dual-LED flash, 5MP front camera, dual SIM slots and supports high-speed LTE (4G). Android Lollipop operating system includes a host of new features, a visual overhaul and numerous under-the-hood improvements to make it faster, more efficient and lighter on the battery. It also works perfectly with all Google apps.

Price: ₹ 18,990

Zebronics launches LED TV

Slim is in

The LED TV is 80cm wide and has a dynamic contrast of 500000:1. Other features include 1366x768 resolution, 178° viewing angle, high-speed connectivity interface, built-in speakers, less than 60W consumption, enhancing power utility in the panel and very thin bezel ensuring much higher aesthetic performance, among others.

Price: ₹ 18,990

Wi-Fi Hotspot: **Connecting Multiple Devices to the Internet**

EFY BUREAU

Time has come to move beyond wires and USB sockets every time you need access to the Internet. Imagine being able to connect to the Internet from anywhere. With the available Wi-Fi devices, users can check their emails, watch movies, listen to music and a lot more, on the go. They can stay connected at all times and can access multiple Wi-Fi-enabled devices without the additional hassle of investing in separate data plans for each device.

There are usually three ways that can be used to access the Internet on the move and these cater to any mobile Internet needs. The conventional way of connecting to the Internet is by using a SIM card, which is ideal for devices like tablets that have a SIM card slot (for example, iPads). You can go for a SIM-only Internet plan for your device with a SIM card slot and get online to catch up on the latest news, watch films, check emails and more.

The other way of gaining access to the Internet is by using a USB dongle, which plugs into a device like a laptop and allows you to access the Internet. Wireless mobile broadband, also referred to as Mi-Fi, is the most recent way of connecting to the Internet. It is a pocket-size wireless device that allows you to create your own secure Wi-Fi hotspot, wherever you need to, and connect multiple wireless gadgets at one time. It is simple to set up and use, with no wires or software to install, and allows you to enjoy carefree surfing anywhere, anytime.

Points to consider before buying a hotspot Wi-Fi device

These days every single handheld device has the option to connect to the Internet for staying connected round the clock. Listed here are some key features and their benefits that would enable you to select the right device according to your specific requirement.

Number of devices to be connected. If you want to connect more than one device at a time, you need a hotspot that is capable of managing that. Mobile broadband is a standalone device and allows one connection at a time, but many connected devices can turn into hotspots that allow multiple connections. Most devices allow up to five connections. For instance, Micromax

SOME WI-FI HOTSPOT DEVICES AVAILABLE IN INDIA

	Idea 3G Smart Wi-Fi hub	Micromax MMX440W Wi-Fi hotspot	Vodafone R206 Z	Airtel Quanta QDPI
				
Price	₹ 2999	₹ 2499	₹ 2399	₹ 2300
Features worth looking at	The compact and portable Wi-Fi hub provides 3G connectivity with a press of a button. It provides connectivity for up to ten devices for Internet sharing at one time. It offers HSPA+ speeds of up to 21.6Mbps DL and 11Mbps DL. It also supports WPS and IPv6.	The sleek and stylish Micromax MMX440W Wi-Fi hotspot provides connectivity for up to 32 devices at a single time. The device also acts as a smart power bank with more than 4400mAh of power to keep you connected at all times. It has 4MB RAM and is compatible with HSDPA/HSPA+ network. You can use it as a personal Wi-Fi on the move by simply plugging in the device.	The compact mobile Wi-Fi device lets you connect up to ten devices. You can connect and experience high Internet speeds of up to 21.1Mbps with 3.75 hours of battery life and create Wi-Fi hotspots up to 100 meters. It allows you to store up to 32GB of data in the micro-SD card. The device provides WPS authentication in addition to regular Wi-Fi password based authentication.	With a flick of a finger, this powerful machine creates a personal Wi-Fi zone, anywhere and at any time. It provides seamless 4G connectivity on the go for six continuous hours. It is five times faster than a regular 3G connection. This is truly a one-size-fits-all device and is a powerful gadget that lets you share your Internet with up to ten users. Data speed recorded is up to 61Mbps downlink/18Mbps uplink in 20MHz.

The prices mentioned here are from various e-commerce portals and are subject to change.

hotspot allows connectivity of up to 32 devices, while Vodafone Wi-Fi hotspot allows connectivity of up to ten devices, at a single time.

Compatibility with the service provider. One important consideration when choosing between 3G and 4G technology is to check for coverage available in your area. If a 4G phone moves out of range of a 4G network, you will only receive 3G speeds. Think about the service provider you are going to use most of the time. Not every Internet service provider will have coverage in all areas and not every wireless device will be compatible with every service provider. So before you buy a portable Wi-Fi hotspot device, check if it is compatible with your SIM, USB datacard and the service provider.

Support for latest technology. While purchasing a Wi-Fi device it is important to check whether the device is compatible with future technology. Also check if the router supports a 3G/4G data card. For instance, Airtel modem supports 3G and LTE networks, whereas Idea Wi-Fi hub device is suited for HSPA+ speed up to 21.6Mbps DL and 11Mbps DL.

Wireless standards. For faster connections and high-speed Internet, one crucial thing to keep in mind is the wireless standards (802.11)-B, G and N. N is defined as the next-gen technology, is newer and supports faster speeds than wireless G. It can reach speeds up to 450Mbps with three antennae, while wireless G supports a maximum theoretical transfer rate of 54Mbps. Therefore N provides better range, better speed and better coverage than G. For example, Airtel 4G hotspot and Vodafone R206Z follow the latest wireless standards to stay ahead of its competition.

Device power source. A Wi-Fi router also acts as a power bank. What can be better than getting the advantage of two devices in one? Today, most of these devices double up as power banks and are available readily in the market. For example, Huawei Wi-Fi E5730 comes with an inbuilt powerful battery of 5200mAh that not only gives continuous working time without the need to charge but also allows you to charge your smartphones and other devices on the go. Idea 3G Smart Wi-Fi hub comes with 1500mAh battery, while Vodafone R206 Z claims to get powerful portability with 3.75 hours of battery life.

Network security. Wi-Fi Protected Setup (WPS) is a network security standard that allows users to easily secure a wireless home network and allows them to connect wireless devices to the network without any loss of information. Almost all hotspot Wi-Fi devices offered by Airtel, Idea, Tata Photon, Vodafone and others support WPS for network security.

Data packages. High-speed connectivity comes at a high price. So it is crucial to select the right device based on data-usage packages offered by different service providers. Data plans for an instant Wi-Fi solution have been custom designed for intended target groups by different providers. For instance, MTS offers postpaid rental plan of, say, 10GB (5GB day and 5GB night, 3G+ network in Delhi region) data usage for ₹ 599, while Airtel provides 10GB (4G data at 3G prices) data usage plan for ₹ 1500.

The Internet has become an integral part of our daily life for staying connected with our friends, relatives and colleagues. It gives us the power to share what is important. Gone are the days of datacards when only one device could be accessed at a given time. Now, with the availability of hotspot Wi-Fi devices, users can connect multiple devices on the go without having to sacrifice on network speed.

Buying a hotspot Wi-Fi device therefore completely depends on the individual user's needs and requirement. Once the requirement is identified, choosing the right device becomes simpler. ●

Ten Commandments to Safeguard Your Bank Account

Dinu Vincent
is an electronics and communication engineering graduate, currently working in the security operation centre of a leading private sector bank in India. He is a certified ethical hacker and holds a computer hacking forensic investigator certification

Ever since Adam and Eve sinned in the Garden of Eden, God's desire has been to restore the broken relationship between God and people. God made a covenant, which is a promise from God that can never be broken. The covenant states that God wants a relationship with the people, but in order to have this loving relationship, they have to turn away from their sin. This can also be interpreted as the act of avoiding mistakes. So if we avoid mistakes, the relationship will exist forever and we will live in prosperity.

In this digital age, money transfer is a matter of a few clicks. With this advantage, there are drawbacks that allow an innocent user to be tricked easily by a fraudster, thus resulting in easy money for the culprit. The few tips explained in this article will help you to stay alert against such practices, and stay in a good relationship with your bank.

Validate the URL

Manoj is an employee working in an information technology (IT) company and his salary account is with HOPE bank. He has to transfer some money to his friend. So he accesses the bank's Internet banking website. Since he frequently uses this facility, he feels something odd about the portal. He identifies that the uniform resource locator (URL) address is *www.internetbanking.h0pebank.com* instead of *www.internetbanking.hopebank.com* (0 instead of o).

Phishing websites are hoax websites that have the look and feel of a legitimate website. Hackers create phishing websites to collect information such as Internet banking credentials, card details, automated teller machine (ATM) pin numbers and personal details, so that they can make use of these to pilfer money from the victim's bank account.

Pharming is the technique to redirect traffic from a legitimate website to a fraudulent one by making use of the former's vulnerabilities in the DNS server, or by modifying the host file of the victim's PC. Web pages used for pharming attacks are the same as that of the genuine website, which makes it difficult to spot the difference.

One good way to get away from these fraudulent websites is to validate their URLs. Nowadays, almost all banking websites and Internet banking portals have EVSSL certificates. Have you ever noticed your browser's address bar turning to green colour while accessing your bank's website? This denotes that the URL is verified by a certificate authority (approved). Phishing sites will lack these certifications.

Enable second-factor authentication

The most practical way to strengthen authentication is to necessitate a second factor after the username/password stage. Since a password is something that a user knows, ensure that the user also has something that thwarts attackers who steal or gain access to passwords.

Traditional two-factor authentication (TFA) solutions use hardware tokens that

users carry on their key chains. These tokens generate one-time passwords (OTPs) for the second stage of the login process. However, hardware tokens are comparatively expensive, difficult to track and replace when broken, and the effort for distributing these is time consuming. Also, these are easy to lose and hard to use.

Banks have come up with several solutions for OTP generation such as short message service based, mobile application based, email based, software token based, interactive voice response (IVR) based solutions and so on.

Carry out up to date patching of machines, use antivirus

Do you know Zeus? I am not talking about the Greek god of the sky and thunder. Zeus is a banking Trojan that is being used to steal banking information by keystroke logging and form grabbing. Zeus's mobile variant called ZitMo is well-known to circumvent popular TFA schemes with security codes being provided via text messages.

SpyEye and Carber have developed their respective mobile counterparts. Dyre, which typically targets customers of large financial institutions, was recently used in a large-scale, credential-phishing campaign targeting international banks.

Each malware tries to evade detection by an antivirus. It intercepts keystrokes, browser data, stored files and basically everything to sneak into a banking account and initiate an illegal money transfer. It even tries to install mobile malware on a smartphone, which allows criminals to steal the OTP.

By regularly applying software patches and using an updated genuine antivirus solution, you can stay away from this malicious software to a good extent. In order to have a healthy PC, always ensure that cracked/pirated operating system/software are not installed. Always remember that nothing comes for free.

Do not trust open/free Wi-Fi

Do you pay your bills online while having pizza and enjoying free Wi-Fi at your favourite coffee shop? Better stop before you pay. Like a lion waiting for its prey, someone is waiting in that Wi-Fi network to steal your credit card information, Internet banking credentials and a lot more even before it reaches your bank.

Experts warn against making any financial transactions on public Wi-Fi. Some even advise against checking social networks or email accounts for the same reason, because too much information can be exposed to hackers that can allow them to gain control of bank accounts. Also, there are rogue hot spots that direct users to legitimate-looking websites that prompt them to provide banking credentials.

Do not click on links that offer billion-dollar prizes

Everyone is familiar with emails saying, "Your email address has been selected to claim the sum of US$ 500,000 in the 2015 European lottery." Expressions such as "your email address was selected" or "your address has won" are blabbermouth signs that the message is part of a scam. After all, you have not used your address to participate in a prize draw, have you? And if you have, it was unlikely to have been European lottery. Fraudsters obviously expect some recipients to suspect a scam and attempt to convince them otherwise.

Similarly, you may receive phishing messages promising a lottery win from Coca Cola, Google's anniversary winning notification, Yahoo lottery award international programme, Microsoft's award promotion and what not. Should you receive an email of this type, visit the specific company's official website; most likely you will find that the company is not actually holding a lottery of any kind. Google translate

service has made life much easier for online fraudsters as now they can send messages to users all over the world in various languages.

Do not trust customer service seeking banking credentials

A phishing mail is an email fraud method in which the perpetrator sends out legitimate-looking emails in an attempt to gather personal and financial information from recipients. Voice phishing (vishing) is the criminal practice of using social engineering over the telephone system to gain access to private personal and financial information from users with a financial motive. Some fraudsters use facilities like Voice over Internet Protocol, caller ID spoofing and automated systems (IVR).

Just like phishing, smishing uses mobile phone text messages to lure consumers. Often the text contains a URL or phone number. The phone number often has an automated voice response system. And again, just like phishing, the smishing message usually asks for your immediate attention. Do not respond to any such messages.

The questions you need to ask yourself are:

1. Do you know the sender of the email? If yes, still be cautious before clicking on a link. If no, do not click on any link.
2. Is there any attachment in the email? If yes, is it executable (a file with extensions like .exe, .bat,

.com, .vbs, .reg, .msi, .pif, .pl or .php)? If so, do not click on the attachment. Even if the file does not contain the above-mentioned extensions, be cautious about opening it.

3. Does the email request personal information? If so, do not reply.
4. Have you checked the link? Move mouse over the link and check the URL. Does it look legitimate or does it look like it will take you to a different website?

If you receive an email or phone call asking you to call, and you suspect it might be a fraudulent request, look up the organisation's customer service number and call that number rather than the number provided in the solicitation email or phone call.

Do not sow your card in every card slot

How many of you have given the entire money in your account to waiter as a tip? Confused? Card skimmers, in the form of a small gadget that can be attached to a pant's belt are available in the market. Always be careful when you give your card to the waiter along with the invoice, and never acquaint him or her with your pin number. Beware of the following:

1. Card skimmers who can capture card data and store or transmit it wirelessly

2. Fake PIN pads to capture PINs

3. Wire-tapping devices placed in between telephone lines to which point-of-sale terminals are connected to capture card data during a transaction

4. Skimming devices sited over card slots of an ATM

Introduction of global Europay, MasterCard and Visa cards, and second-factor authentication like Verified by Visa/MasterCard Secure Code rollout, have brought a great level of security for card transactions. Banks have provided easier methods for customers to block cards and get a confirmation to that effect after blocking the card.

Thumb rule. Always insist on the card to be used in your presence and keep your password a secret. Never entrust your debit/credit card with anyone. Always have your bank helpdesk number handy so that it can be reached for blocking your card immediately in required cases.

Do not let anyone speculate your password

Many of us fill the very important password space with our full name, date of birth, mobile number, partner's name and so on.

These are the details that you have populated in your social media profiles. And still you think that these are tough to guess! While in truth, these seemingly uncrackable passwords are commonly used for social media accounts, Internet banking, email accounts, e-wallets, etc. Always follow the thumb rule of using hard-to-guess passwords and change the same frequently.

Pattern passwords are present in mobile banking applications for making fund transfer simple and fast. Sometimes these patterns remain on your mobile screens, which result in a smudge attack.

Do not let your mobile phone be the tool to loot you

Cybercriminals use fake banking applications having the look and feel of legitimate banking apps to trick users. They also use other popular apps, such as utilities, chats, portals and security apps to rope users into their scams and steal their mobile banking credentials. These fake apps upload stolen user information such as mobile phone numbers, account details, login credentials and even text messages (OTPs) to the attackers' command and control servers. Some malwares/fake apps are delivered through text messages containing a link asking users to upgrade the bank's app or downloaded by other malware.

Always install applications from trusted sources. Your smartphone is powerful and, at the same time, vulnerable to viruses/malwares.

Do not give an opportunity to eavesdroppers

There can be a number of risks if you do not take proper care while using computers in Internet cafes and libraries. Avoid financial transactions that might reveal valuable passwords or personal information such as credit card numbers.

1. Check for hardware keyloggers.
2. If possible, use a trusted Web based spyware-detection program to scan for spyware before using an untrusted public computer.
3. While basic keyloggers do just that, for logging your keys you could use an on-screen/virtual keyboard.
4. If you have been using the Internet, ensure you use the browser tools to delete files and cookies and clear the browsing history.
5. Protect any passwords you are going to use by using the browser's Internet options menu. If in doubt, check the browser's Help option.
6. Consider changing any passwords you may have used on a public computer once you get back home.
7. Be on the lookout for shoulder surfers, that is, make sure that no one is watching over your shoulder while you enter your passwords.

I hope this article gives you at least a vague insight into the kinds of risks your bank accounts may be exposed to. While technological innovations have been a big boon to mankind in today's fast-paced life, it is always better to put in a little caution from your end to ensure that the same technology does not strike back at you. After all, it is your hard-earned money at stake. Protect it from, as I may put it, e-looters. Do contact your bank immediately if you suspect any fraudulent activity in your bank account. ●

Join the World's Largest Exhibition for Wearable

2nd WEARABLE EXPO

Wearable Device & Technology Expo

Jan. 13–15, 2016 / Tokyo Big Sight, Japan

NEW

Int'l Wearable Device Startups Area

STARTUPs

An Area for Wearable Startups to Present Their Latest Products

Exhibit and expand your business!

For more information ►►► www.wearable-expo.jp/en/

"Largest" in reference to the exhibitor number of trade shows for wearable device & technology with the same concept.

Organised by

Reed Exhibitions

WEARABLE EXPO Show Management, Reed Exhibitions Japan Ltd.
18F Shinjuku-Nomura Bldg., 1-26-2 Nishishinjuku, Shinjuku-ku, Tokyo 163-0570, JAPAN
TEL: +81-3-3349-8519 E-mail: wearable-eng@reedexpo.co.jp Web: www.wearable-expo.jp/en/
A division of Reed Business Registered in England, Number 678540

An EFY GROUP EVENT

iotshow.in

January 11th-13th, 2016

Bangalore International Exhibition Centre (BIEC), Bengaluru

India's first mega event for all the stake-holders of Internet of Things ecosystem to come together.

Panel Discussions

Standardisation for the IOT Ecosystem: An enabler or a roadblock?
Moderated by Narang N Kishor, convener of panel by Bureau of Indian Standards for Smart Infrastructure

Security of Things: How can we really make Internet of Things secure?
Moderated by Rishi Bhatnagar, Target Accelerator

Key Speakers


Vinay Chaddha
CEO, GVC Systems


Martin Woolley
Technical Program Manager, Bluetooth SIG


Narang N Kishor
Convener of panel by BIS for Smart Infrastructure


Nirad Deshpande
Ethernet Powerlink Standardisation Group


Shreekant Pawar
CMO, Diabeto Medtech India Pvt Ltd


Dr. Srinivas Mandavilli
Country Manager, Imagination Technologies


Srinivasa Moorthy
CEO, Andhra Pradesh Electronics & IT Agency


Syam Madanapalli
CTM, iRam Technologies


Hemant Karnat
CTO, Shalaka Technologies


Yuping Tseng
CTO, ThroughTek

Smart Humans

Nanotech sensors for Human Body Health Monitoring
Dr Vijay Mishra, CTO, CeNSE - IISc

How to build a device that keeps the doctor away
Srinivasa Moorthy, CEO, Andhra Pradesh Electronics & IT Agency

Creating the edge tier of the Internet of Things
Martin Woolley, Technical Program Manager, Bluetooth SIG

- Hardware is Hard! Here's how to solve through Indian Manufacturing Challenges
- How we developed a wearable at IISc, for remote monitoring of newborns
- How to take your medical device from idea to regulatory approved product

Smart Industry & Office

Building Secure, Flexible IoT Platforms
Dr. Srinivas Mandavilli, Country Manager, Imagination Technologies

How to integrate Industrial IoT with manufacturing systems
Hemant Karnat, CTO, Shalaka Technologies

Building Industrial IoT Devices That Sell (Learning from experience)
Vinay Chaddha, CEO, GVC Systems

- How to achieve real time, deterministic, redundant and safe communication on Ethernet using open source POWERLINK
- How to take your industrial IoT device from Prototype to product
- Making sense out of sensor data

Smart Automotive

How we use V2V and V2X to make smarter cars
Sofia Sekar and team, Mercedes Benz Research

Threat perception and attack scenarios in Automotive
Dr. SK Sinha, CEDT, IISc

The mistakes I have made building ADAS, And How You Can Learn From Them
Plato Pathrose, System Engineer Lead, Magna Electronics, Germany

- "Deep Learning": Deep dive into large data
- Introduction to Device Tree for automotive engineers

Smart Cities & Homes

How ecosystem principles can help us build smarter homes
Yuping Tseng, ThroughTek

Building Smart Cities with Everything as a service
Syam Madanapalli, CTM, iRam Technologies

Solving imaging challenges for smart home market
Ting Zhou, Omnivision Technologies

- Building a smart home using renewable energy micro-grid with existing infrastructure
- Idea to production: Building your first minimum viable product for smarter homes
- How to use HomeKit and AWS IoT to develop smart and connected appliances

Workshops

- Quickly designing better hardware using COTS
- Design & Fabrication of an ECU for power window lifter
- Integrating off-the-shelf components to the cloud
- Security, Surveillance & Monitoring: The right way to do it
- How to build a smart aquarium maintenance system
- Building Industrial IoT Devices 101
- Build your first open source Smart Agriculture project (Hands-on)
- How to improve your soldering using best practices
- 3D Printing: How to design & print
- Python based deep learning

To register, visit: www.iotshow.in

For details, Call: Jyotsna (011-40596605) or write to us at: efyexpo@efy.in

LED Bazaar.in

Chandani Chowk Prices With 5-Star Service

Avail Upto

30%

Discount

ON LED LIGHTS


Bay Lights


Bulbs


Tube Lights


Panel Lights


Spot Lights


Solar Lantern

For more details, call: **9599814784** or write to us at: **foryou@ledbazaar.in**

FREE SHIPPING in Delhi, NCR **SHOP NOW**

ADVERTISERS' PRODUCT CATEGORY INDEX

EFY Magazine Attractions During 2016

MONTH	TECHNOLOGY FOCUS	MARKET SURVEYS	BUYERS' GUIDE FOR ELECTRONICS LABS	eSTYLE BUYERS' GUIDE
January	Latest Technologies for Enabling the Internet	Connectors and Terminals	Development Boards	Microwave Ovens Under ₹ 10,000
February	Drones	Security and Surveillance	Desktop Power Supplies	126cm (50-inch) Flat-Panel Televisions
March	Intuitive Gesture Control	Test and Measurement Equipment	Noise Meters	Blood-Pressure Monitors
April	Latest Display Technologies	Solar Industry	Digital Multimeters	Wireless Printers for Homes
May	Solid-State Storage	3D Printers	3D Printers Under ₹ 100,000	Fitness Wristbands
June	Affordable Virtual Reality	The Internet of Things	Wi-Fi and Radio Frequency Modules	Earphones
July	Connected Homes and Appliances	Home Automation	Budget-Friendly Oscilloscopes	Wireless Routers for Homes
August	Self-Driving Cars	LED Lighting	LED Chips and Bulbs	Low-Priced Tablets
September	Solar Cells to Inverters: What's New	Strategic Electronics	Soldering/Desoldering Stations	3G/4G Dongles
October	Sensors	Consumer Electronics	LCD and OLED Display Modules	Smart Televisions
November	The Internet of Things	Medical Electronics	Desktop PCB Manufacturing Equipment	Blood-Sugar Monitors
December	Materials: 3D Printing to Solar Panels	Materials and Chemicals	Motors and Drives	Low-Priced Laptops

ADVERTISERS' INDEX

Ideal Equipment for Low-Resistance Measurement

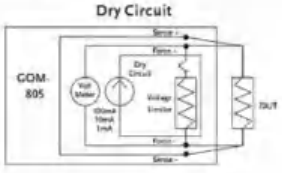
40 ANNIVERSARY
The hallmark of GW Instek for 40 years.

GOM-804/805 D.C. Milliohm Meter

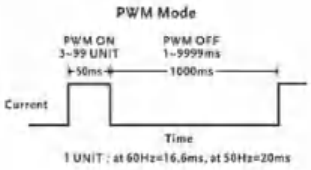
GW Instek launch a new series of D.C. milliohm meter - GOM-804/805, which abundantly feature 3.5-inch TFT display, maximum 50,000 counts measurement display, the rapid sampling rate of 60 readings per second, optimum 0.05% measurement precision, four wire measurement method as well as the temperature measurement and temperature compensation measurement function to meet the requirement of low resistance measurement application. The GOM-805 also includes various drive modes and Dry circuit for contact resistance measurement applications. More features, including 20 sets of panel setting memory and many external control interface such as RS-232C, USB, Handler/Scan/EXT IO or GPIB (option), greatly elevate GOM-804/805 milliohm meter's convenience on practical applications.

- **50,000 Counts Display**
- **3.5" (320 x 240) TFT LCD Display**
- **High Accuracy of 0.05% Precision**
- **1Amp Test Current, 1μΩ Resolution**
- **Fast Measurement of 60 Readings Per Second**
- **Four wire Resistance Measurement**
- **Temperature Compensation Measurement Function**
- **Delayed Measurement**
- **20 sets of Panel Setting Memory**
- **Dry Circuit (GOM-805 Only)**
- **Drive Modes : DC+/DC-, Pulsed, PWM, Zero(GOM-805 Only)**
- **Interface : USB Device, RS-232C, Handler/Scan/EXT I/O, and GPIB(Option)**

DRY CIRCUIT TEST
(for GOM-805 only)



VARIOUS DRIVE MODES
(for GOM-805 only)



For more details, please contact your nearest distributor or you may directly write to India_marketing@goodwill.com.tw

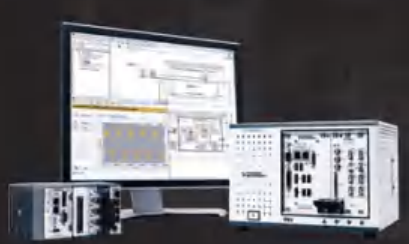
Bangalore & Pune : Integrated Services & Consultancy, +91-9845070872, sales@isc4esaindia.com
Chennai : Vamara Techware, +91 9894388839, sales@vamara.in
Hyderabad : Mohan Marketing Associates, +91-9346004041, sales@mohanmarketing.com
Kolkata : Arihant Trading Company, +91-9830033381, gautamg1966@gmail.com
Mumbai : Automate Process Control, +91-9223508308, automatemumbai@gmail.com
Delhi : Salicon Nano Technology Pvt Ltd, +91-9810575940, info@salicontech.com
Thiruvananthapuram : Innovative Instruments Inc, 0471-2316385, instrument_inc@vsnl.net

GW INSTEK
Simply Reliable

GOOD WILL INSTRUMENT CO., LTD.
www.gwinstek.com

Engineer Change.

Engineering. It pushes us forward. As the world grows more complex, we face more diffi cult challenges. So how do you speed up the next engineering breakthrough? By changing your approach. With National Instruments, engineers and scientists are taking advantage of an integrated software and hardware platform that abstracts the complexity of measurement and control systems.



>> You bring the vision. We'll bring the tools. Learn more at ni.com.

NI Systems (India) Private Limited
Phone: 1800 103 9449 (Toll Free) | Email: ni.india@ni.com

NATIONAL INSTRUMENTS

RNI No. DELENG/2012/51582

6 Instruments. 1 Scope. Infinite Versatility.

The 6-in-1 MDO3000 Mixed Domain Oscilloscope with a spectrum analyzer. Starting at $3,350.*

Designs have evolved, integrating analog, digital and RF technologies. Now, it's the oscilloscope's turn. Introducing the MDO3000 Mixed Domain Oscilloscope. Featuring a spectrum analyzer, function generator and more, it's the only scope that comes with the instruments you use most, built-in. It's also upgradeable, enabling you to add instruments and increase bandwidth as your needs grow. So you get unlimited versatility at a starting price that's anything but limiting.

6 Advanced Instruments Built In

- Oscilloscope: 100 MHz-1 GHz models, 2 or 4 channels, 5 GS/s sample rate, 10 Mpoint record length
- Spectrum Analyzer: 9 kHz-3 GHz with 3 GHz wide capture bandwidth
- Logic Analyzer: 16 channels, 121 ps timing resolution
- Arbitrary/Function Generator: 50 MHz, 13 standard plus arbitrary waveforms
- Protocol Analyzer: Serial data trigger, decode and analysis
- Digital Voltmeter: 4-digits resolution

For more information, please call our sales channel partner in the city nearest to you. **Ahmedabad :** Optimized Solutions Pvt. Ltd. (91-79) 30080808 / 26589008; **Bangalore:** Aarjay International (91-80) 43409200, Convergent Technologies (91-80) 23490111 / 179; **Chennai :** Aarjay (91-44) 40509200, Primetech Instruments Pvt. Ltd. (91-44) 24492961; **Andhra Pradesh / Orissa :** Peridot Technologies (91-40) 23405855; **Indore :** Optimized Solutions Pvt. Ltd. (91) 9909979950; **Kerala :** Convergent Technologies (91-471) 2462412 / 386; **Kolkata :** Techno Scientific : (91-33) 32948567; **Mumbai :** Vitronics India (91-22) 28506037; **New Delhi :** S.P.I. Engineers Pvt. Ltd. (91) 9810157421; Convergent Technologies (91-11) 42481121 / 1131; **Pune :** Cyronics Instruments Pvt. Ltd. (91-20) 24208200; **North East India :** Vishal Vyapar Vikash (91-361) 2540701.

Enquires Email To : india.mktg@tek.com

Tektronix®

*Starting price includes an oscilloscope, spectrum analyzer and digital voltmeter. Other instruments and bandwidth may be added for additional cost.